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Eastern Pacific Expeditions of the New York Zoological Society. XXXIV. Mollusks from the West Coast of Mexico and Central America. Part III.<sup>1</sup>

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(Plate I).

[This is the thirty-fourth of a series of papers dealing with the collections of the Eastern Pacific Expeditions of the New York Zoological Society made under the direction of William Beebe. The present paper is concerned with specimens taken on the Templeton Crocker Expedition (1936) and the Eastern Pacific Zaca Expedition (1937-1938). For data on localities, dates, dredges, etc., refer to *Zoologica*, Vol. XXII, No. 2, pp. 33-46, and Vol. XXIII, No. 14, pp. 287-298.]

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INTRODUCTION.

This is the third of a series of papers dealing with collections of mollusks taken on the Templeton Crocker Expedition (1936) and the Eastern Pacific Zaca Expedition (1937-1938). The general plan of presentation followed in the present contribution is that mentioned in Part II of this series of papers<sup>2</sup>. Formal headings and keys are given only for the species collected by the Expeditions of 1936 and 1937-1938.

<sup>2</sup> Hertlein, L. G., and Strong, A. M. Eastern Pacific Expeditions of the New York Zoological Society. XXXII. Mollusks from the West Coast of Mexico and Central America. Part II. *Zoologica*, New York Zool. Soc., Vol. 28, Pt. 3, December 6, 1943, pp. 149-168, pl. 1.

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## CLASS PELECYPODA.

### Order Prionodesmacea.

#### Superfamily Ostracea.

#### FAMILY OSTREIDAE.

#### Genus *Ostrea* Linnaeus.

Key to the species of *Ostrea*.

- A. Margin with denticles or transverse striae
- a. Margin plicated
- b. Upper valve flat, fitting into the lower ..... *palmula*
- bb. Upper valve arched, interlocking with the lower
- c. Shape arcuate, with 4 or 5 large corrugations; denticles along dorsal half of margin..... *megodon*
- cc. Shape round or subrounded; transverse striae on margin just below hinge..... *fisheri*
- aa. Margin usually not plicated; interior iridescent, burnished bronze, or white ..... *videscens*
- B. Margin without denticles or transverse striae ..... *columbiensis*

#### *Ostrea columbiensis* Hanley.

*Ostrea columbiensis* Hanley, *Proc. Zool. Soc. London*, for 1845 (issued February, 1846), p. 107. "Hab. St. Elena, West Columbia, adhering to the rocks at half-tide (Cuming)".—Sowerby, *Conch. Icon.*, Vol. 18, *Ostraea*, January, 1871, species 10, pl. 7, figs. 10a, b. "St. Helena, Cuming. Mazatlan. Lower California".

*Type Locality*: Santa Elena, Ecuador, adhering to rocks at half-tide.

*Range*: San Bartolome [Turtle] Bay, Lower California, and the Gulf of California, to Coquimbo, Chile.

*Collecting Station*: Nicaragua: Isla Encantada, Corinto.

*Description*: Shell varying in shape from suborbicular to oblong, often about 3 inches long; lower valve usually attached by its entire lower surface; the upper valve fits into the lower and is continued by lamellae to

the margin which often expands into wavy foliations; upper surface often rayed with purple on a white ground; the interior of the valves white; margin not dentate; scar reniform in shape; the margin as well as the muscle scar is usually colored purple.

*Ostrea columbiensis* never attains the size or thickness of *O. chilensis* Philippi. It also differs in the purple margin and in the presence of yellow or purple rays ornamenting the upper valve.

*Distribution*: This species occurs from Lower California to Chile and is usually found adhering to rocks or mangroves. It is gathered and sold for food in the markets of Peru.

#### *Ostrea fisheri* Dall.

*Ostrea jacobaea* Rochebrune, *Bull. Mus. Nat. Hist. Nat. Paris*, Vol. 1, 1895, p. 241. "Iles de la Baie de la Paz."—Contreras, *An. Inst. de Biologia*, Vol. 3, No. 3, 1932, p. 210, figs. 22 and 23. Islands of San Jose and Espiritu Santo, Gulf of California.

*Ostrea fisheri* Dall, *Nautilus*, Vol. 28, No. 1, May, 1914, p. 1. "Gulf of California." New name for *Ostrea jacobaea* Rochebrune, not *O. jacobaea* Linnaeus.

*Type Locality*: Islands in the Bay of La Paz, Lower California.

*Range*: San Luis Gonzaga Bay, Gulf of California, to Panama and the Galápagos Islands.

*Collecting Station*: Mexico: Santa Inez Bay, Gulf of California.

*Description*: Subcircular or rounded in outline, thick, valves gently arched, externally colored blackish-purple or dark red; margin often but not always with 6 to 8 plications which in some specimens give rise to irregular hollow tubercles; margin without denticles; ligamentary pit triangular and small in proportion to the size of the shell; transverse striations occur along the margin just below the ligamentary pit; interiorly the margin and the muscle scar are colored purple and in some specimens nearly all the interior is colored blackish-purple but in others the earlier portion is white. A large specimen from La Paz, Lower California, in the collections of the California Academy of Sciences, measures approximately 172 mm. from beak to base.

*Ostrea fisheri* bears a resemblance to *O. hyotis* Linnaeus, an Indo-Pacific species, and also to *O. sinensis* Gmelin, described from China. It also resembles *O. thomasi* McLean,<sup>3</sup> a species living off Florida, and *O. tamiamiensis* Mansfield from the Pliocene of Florida.

*Distribution*: *Ostrea fisheri* occurs at

<sup>3</sup> *Ostrea (Ostrea) thomasi* McLean, *Not. Nat. of Acad. Nat. Sci. Philadelphia*, No. 67, January 14, 1941, p. 7, pl. 3, figs. 1, 2, pl. 4, figs. 1, 2. The type was "dredged off Palm Beach, Florida, in 300 feet of water. It was firmly attached to a piece of coral. . . ."

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various localities from the Gulf of California to the Galápagos Islands but so far as known it appears to be abundant only in the southern part of the Gulf of California. It is known to occur from Pliocene to Recent.

***Ostrea iridescens* Gray in Hanley.**

*Ostrea iridescens* Gray, M.S. in Hanley, Conch. Miscell., *Ostrea*, 1854, pl. 2, figs. 6 and 7—Contreras, *An. Inst. de Biología*, Vol. 3, No. 3, 1932, p. 194, figs. 1 and 2. San Lucas; Mazatlan to Panama. [Not all the synonymy. Not the record "la costa occidental de Africa."]

*Ostraea spathulata* Lamarck, Sowerby, Conch. Icon., Vol. 18, *Ostraea*, 1871, species 13, pl. 8, fig. 13. "Guacomayo, Co. of America".

Not *Ostrea spathulata* Lamarck, *Hist. Nat. Anim. s. Vert.*, Vol. 6, 1819, p. 206.

**Type Locality:** Reef at Panama City, Panama (here designated).

**Range:** La Paz, Lower California, to Panama.

**Collecting Stations:** Mexico: Banderas Bay, shore; Tenacatita Bay, shore; Port Guatulco, shore; Santa Cruz Bay, shore; Tangola-Tangola Bay, shore; El Salvador: Conchagueta Island, Gulf of Fonseca; Nicaragua: Potosi and Monypenny Point, Gulf of Fonseca; Costa Rica: Gulf of Dulce; Port Culebra.

**Description:** Shell elongately rectangular, with laminated structure, hinge long and square; large denticles occur along the margin below the hinge, and these fit in corresponding sockets in the opposite valve; the color of the interior is sometimes white but is usually beautifully iridescent and often of a brownish metallic luster; the muscle scar is large, reniform and variable.

This species has sometimes been cited under the name of *Ostrea prismatica* Gray, a South African species.

**Distribution:** *Ostrea iridescens* occurs from the Gulf of California to Panama and is often observed on rocks exposed between tides. The species is known to occur in the Pleistocene of Mexico and Ecuador and it probably occurs in the Pliocene of Peru.

***Ostrea megodon* Hanley.**

*Ostrea megodon* Hanley, *Proc. Zool. Soc. London*, Pt. 13, for 1845 (issued February, 1846), p. 106. "Hab. Peru (Cuming). Mus. Cuming."—Sowerby, Conch. Icon., Vol. 18, *Ostraea*, 1871, species 24, pl. 12, figs. 24a, 24b. Peru.

**Type Locality:** Peru.

**Range:** Scammon Lagoon, Lower California, and the Gulf of California, to Paita, Peru.

**Collecting Station:** Costa Rica: 14 miles S.E. of Judas Point (214-D-1-4), 42-61 fathoms, mud, shell, rocks.

**Description:** Shell arcuate, usually at-

tached by the tip of the umbo; margin folded into 4 or 5 large rounded plications and occasionally with additional smaller folds posteriorly; a row of denticles usually occurs along the margin from the hinge to about half the length of the shell; interior white with green or whitish-green margin.

Related species occur in the Miocene of the Caribbean region.

**Distribution:** This species occurs from Lower California to Peru. It usually occurs in fairly shallow water. The specimens in the present collection were dredged in 42-61 fathoms. The species is known from Pliocene to Recent.

***Ostrea palmula* Carpenter.**

Plate I, Figure 14.

*Ostrea ? conchaphila*, var. *palmula* Carpenter, Cat. Mazatlan Shells, March, 1856, pp. 163, 550. "Mazatlan; extremely rare; L'pool Col. S. W. Mexico, P. P. C.—Upper California, Nuttall."

*Ostraea mexicana* Sowerby, Conch. Icon., Vol. 18, *Ostraea*, 1871, species 35, pl. 16, figs. 35a, b, c. "Tehauntepec, Mexico."

**Type Locality:** Mazatlan, Mexico.

**Range:** San Ignacio Lagoon, Lower California, and the Gulf of California, to Tumaco, Colombia, and the Galápagos Islands.

**Collecting Stations:** Mexico: Concepcion Bay, Lower California, 2½ to 4 fathoms, attached to calcareous material; Port Guatulco; Nicaragua: San Juan del Sur; Costa Rica: Port Parker; Colombia: Gorgona Island.

**Description:** Attached by the lower valve which turns up forming a cup-shaped depression; upper valve nearly flat and fitting into the upturned lower valve; margin usually plicated, sometimes with as many as 15 foliaceous plications; the exterior is usually some shade of green or purplish-blue; interiorly the margin is ornamented by a row of fine denticles which fit into corresponding sockets in the opposite valve; the margin is colored a dark purplish-blue, the muscle scar may be dark bluish-purple or light olive in color and the remainder of the interior may be white, olive, or bluish in color.

*Ostrea palmula* is a variable species and has been described under several different specific names in the literature. It is characterized by the flattish upper valve which fits into the plicate lower valve, and by the purplish-blue dentate margin. The form cited under this name from California and Washington can be referred to *Ostrea lurida laticaudata* Carpenter.

**Distribution:** *Ostrea palmula* occurs abundantly between tides at many localities from Lower California to Panama and the Galápagos Islands. It is usually attached to rocks or to mangroves and occurs abundantly on reefs exposed to the surf. It is known to

occur in the Pleistocene and probably occurs from Pliocene to Recent in the Gulf of California region.

Superfamily Pectinacea.

FAMILY PECTINIDAE.

Genus *Pecten* Müller.

Key to the subgenera of the Pectinidae.

- A. Right valve arched, left valve flat or nearly so ..... *Pecten* s.s.  
 B. Both valves convex  
 a. Shell corrugated, usually thick, strongly sculptured, usually brightly colored  
 b. Ribs and interspaces strongly radially striated  
 c. Shell large, very thick, ribs 9-12, often noded ..... *Lyropecten*  
 cc. Shell smaller, thinner, ribs 5-7, not noded ..... *Mesopeplum*  
 bb. Ribs and interspaces without strong radial striae  
 d. Ears nearly equal in length  
 e. Shell small, oblique, thin ..... *Leptopecten*  
 ee. Shell large, less oblique, thick, very convex .... *Plagioctenium*  
 dd. Ears unequal in length, the right markedly the longer... *Chlamys*  
 aa. Shell not corrugated, very thin, glassy, delicate sculpture, colored wholly or partly white  
 f. Both valves with radial or reticulate sculpture ..... *Delectopecten*  
 ff. Right valve with concentric, the left with radial, sculpture *Cyclopecten*

Subgenus *Pecten* s.s.

Key to the species of *Pecten* s.s.

- A. Right valve very highly arched; about 19-20 low rounded ribs ..... *vogdesi*  
 B. Right valve gently arched; about 22-23 radial ribs  
 a. Ribs high, squarish, interspaces flat-bottomed ..... *diegensis*  
 aa. Ribs lower, broader, and these as well as bottoms of interspaces often somewhat triangular in cross section ..... *sericeus*

*Pecten (Pecten) diegensis* Dall.

*Pecten floridus* Hinds, Zool. Voy. *Sulphur*, Moll., Pt. 3, 1844 (dated January, 1845, on cover of Pt. 3), p. 60, pl. 17, figs. 6, 6a. "Inhab. San Diego, California. In five fathoms, among mud."

Not *Ostrea* [= *Pecten*] *florida* Gmelin, 1790.

*Pecten (Pecten) diegensis* Dall, *Trans. Wagner Free Inst. Sci.*, Vol. 3, Pt. 4, April, 1898, p. 710. "Pleistocene of San Diego; Hemphill. Living on the adjacent shores

from Monterey, California, southward." A new name for *Pecten floridus* Hinds, 1844, not *Ostrea* [= *Pecten*] *florida* Gmelin, 1790. —Arnold, U. S. Geol. Surv., Prof. Paper 47, 1906, p. 127, pl. 51, figs. 1, 1a, 1b. Monterey to San Diego, and in the Pleistocene of San Diego, California.

*Type Locality*: San Diego, California, in 5 fathoms, mud.

*Range*: Cordell Bank, California, to Gorda Banks, off Cape San Lucas, Lower California.

*Collecting Stations*: Mexico: East of Cedros Island (126-D-3, 10, 11, 12), 40-60 fathoms, mud, crushed shell, eel grass; Gorda Banks (150-D-2), 75 fathoms, sand.

*Description*: Right valve convex, ornamented by 22 or 23 flat-topped ribs which are generally longitudinally ridged or sulcated on top. Left valve flat or nearly so, and ornamented by 21 or 22 prominent, narrow, convex-topped ribs.

*Distribution*: This species is often dredged off southern California in 10 to 30 fathoms. It apparently occurs in deeper water further south. The present record of specimens dredged on Gorda Banks in 75 fathoms is an extension south in the known range of the species. It is known to occur north to Cordell Bank, California.

*Pecten (Pecten) sericeus* Hinds.

*Pecten sericeus* Hinds, Zool. Voy. *Sulphur*, Moll., Pt. 3, 1844 (dated January, 1845, on cover of Pt. 3), p. 60, pl. 17, figs. 1, 1a. "Inhab. Bay of Panama. In fifty-three fathoms, on a muddy floor".

*Pecten (Pecten) sericeus* Hinds, Hertlein, *Proc. Calif. Acad. Sci.*, Ser. 4, Vol. 21, No. 25, 1935, p. 303, pl. 18, figs. 14, 15; pl. 19, figs. 3 and 4. Various localities cited, from east of San Jose del Cabo, Lower California, to Panama.

*Type Locality*: Bay of Panama, in 53 fathoms, muddy bottom.

*Range*: Santa Inez Bay, Gulf of California, to Panama. Also Maria Madre Island, Clarion Island, and Cocos Island.

*Collecting Stations*: Mexico: Arena Bank, Gulf of California (136-D-1, 4, 26, 27, 31), 35-50 fathoms, mud, *Arca* conglomerates, sand, crushed shell, calcareous algae, rock; Santa Inez Bay (147-D-2), 60 fathoms, mud, crushed shell; Gorda Banks (150-D-9), 50-60 fathoms, muddy sand; 3 miles off Pyramid Rock, Clarion Island (163-D-2), 55 fathoms, rock, coral; Costa Rica: Port Parker (203-D-3), 12 fathoms, shelly mud; Panama: Hannibal Bank west of Coiba Island, 35 fathoms, rocks, mud, coral.

*Description*: Right valve gently arched, the ribs are lower, broader, and are separated by slightly wider interspaces than are those of *P. diegensis*. Some of the large specimens reveal the presence of shallow



grooves separating three minor riblets on top of each rib, the middle riblet the highest of the three. In some cases a single riblet occurs directly in the center of the rib. The ribs on the flattened left valve are less prominent and wider spaced than are those of *P. diegensis*. On the ventral portion of some large left valves a faint riblet occurs in the interspaces between the ribs. The largest specimen of *Pecten sericeus* in the present collection measures 63 mm. from beak to base. On one of the specimens a *Capulus californicus* Dall is attached to the anterior side of the umbo of the right valve in exactly the same position as it occurs on some specimens of *Pecten diegensis*.

*Distribution:* This species occurs from the southern part of the Gulf of California to Panama, and off Maria Madre Island, Clarion Island and Cocos Island.

***Pecten (Pecten) vogdesi* Arnold.**

*Pecten (Pecten) vogdesi* Arnold, U. S. Geol. Surv., Prof. Paper 47, 1906, p. 100, pl. 33, figs. 1, 1a; pl. 34, fig. 1. "The type of this species (a right valve) is from the upper San Pedro formation at San Pedro, California, Pleistocene. Also other localities.—Hertlein, *Proc. Calif. Acad. Sci.*, Ser. 4, Vol. 21, No. 25, 1935, p. 304, pl. 19, figs. 16 and 17. Various localities from Magdalena Bay, Lower California, and the Gulf of California, south to Paita, Peru. Pliocene and Pleistocene of California and Lower California.

*Type Locality:* Upper San Pedro formation (Pleistocene), San Pedro, California.

*Range:* Magdalena Bay, Lower California, and the Gulf of California, to Paita, Peru.

*Collecting Stations:* Mexico: Arena Bank (136-D-13, 28, 30), 35-85 fathoms, mud, sand, *Arca* conglomerate, weed; Ceralbo Island; Ceralbo Channel (137-D-30), 46 fathoms, rock; Santa Inez Bay (141-D-2, 3, 4), 10-20 fathoms, sand, crushed shell, weed, also on shore; Arena Point area; Gorda Banks (150-D-6), 60 fathoms, muddy sand, rocks; Manzanillo (184-D-1, 2), 25-30 fathoms, sand; Tenacatita Bay; Port Guatulco (195-D-19-20), 17-23 fathoms, gravel, mud, crushed shell; Costa Rica: Port Parker (203-D-1-2-3) 10-15 fathoms, sand, mud, crushed shell; Port Culebra; Golfito, Gulf of Dulce; Panama: Gulf of Chiriqui, David Bay and Isla Parida to Bahía Honda (221-D-1-5), 35-40 fathoms, sandy mud.

*Description:* Right valve highly arched and ornamented by 19 to 20 low rounded ribs. Left valve gently concave, and ornamented by about 22 low, square ribs. The color of the shell is usually light brown or reddish-brown.

This species has also been recorded in west American literature under the names of *Pecten dentatus* G. B. Sowerby, *Pecten*

*excavatus* Anton and *Pecten cataractes* Dall.

*Distribution:* This species occurs fairly commonly from Magdalena Bay, Lower California, to Peru, from near shore to 50 fathoms. The deepest occurrence in the present dredgings was at 85 fathoms. *Pecten vogdesi* also occurs in the Pliocene and Pleistocene of California and Lower California.

Subgenus ***Chlamys*** Bolten.

***Pecten (Chlamys) lowei* Hertlein.**

*Pecten (Chlamys) lowei* Hertlein, *Proc. Calif. Acad. Sci.*, Ser. 4, Vol. 21, No. 25, September 26, 1935, p. 308, pl. 19, figs. 1, 2, 7, 8. "From Carmen Island, Gulf of California, from a depth of 20 fathoms."

*Type Locality:* Carmen Island, Gulf of California, in 20 fathoms.

*Range:* Carmen Island, Gulf of California, and Clarion Island, to Panama and the Galápagos Islands. ?Santa Catalina Island, California.

*Collecting Stations:* Mexico: Arena Bank (136-D-4, 22), 45-55 fathoms, mud; 3 mi. off Pyramid Rock, Clarion Island (163-D-2), 55 fathoms, rock, coral; Manzanillo (184-D-2), 30 fathoms, gravelly sand; Costa Rica: Golfito, Gulf of Dulce (218); Panama: Hannibal Bank (224), 35-40 fathoms, rocks, coral, sand, shells, mud.

*Description:* Right valve with a well developed byssal notch under the right auricle. The valves are ornamented by 20 to 22 rounded triangular ribs upon which spinose riblets occur and a spinose riblet occurs in each interspace. The color is white or gray flecked with brown or on some specimens the greater part is orange or reddish-brown. One of the largest specimens in the present collection measures approximately 18.5 mm. from beak to base.

*Distribution:* This species is known from Carmen Island, Angel de la Guardia Island, and Arena Bank in the Gulf of California, off Cape San Lucas, Lower California, Manzanillo, Mexico, Gulf of Dulce, Costa Rica, Hannibal Bank, Panama, and the Galápagos Islands. A specimen possibly of this species was dredged off Catalina Island, California, but the occurrence of the species there is not positively known.

Subgenus ***Plagioctenium*** Dall.

***Pecten (Plagioctenium) circularis* Sowerby.**

*Pecten circularis* Sowerby, *Proc. Zool. Soc. London*, October 9, 1835, p. 110. "Hab. ad Sinum Californiae. (Guaymas)". "Found in sandy mud at a depth of seven fathoms."

*Pecten (Plagioctenium) circularis* Sowerby, Arnold, U. S. Geol. Surv., Prof. Paper 47, 1906, p. 125, pl. 42, figs. 3, 4, 5, 6; pl. 44, figs. 6, 6a, 6b, 7. Pliocene and Pleistocene. Recent from the Gulf of California to Santa Elena, Ecuador.

*Type Locality*: Guaymas, Mexico, 7 fathoms, sandy mud.

*Range*: Cedros Island, Lower California, and the Gulf of California, to Paita, Peru.

*Collecting Stations*: Mexico: East of Cedros Island (126-D-2), 38 fathoms, mud; Arena Bank (136-D-18), 40 fathoms, mud; Santa Inez Bay (143-D-3, also beach), 35 fathoms, mud, crushed shell; (145-D-1, 3, 4-13 fathoms, sand; Concepcion Bay, anchorage 1 mile south of San Domingo Point; Arena Point area; Gulf of California; Cape San Lucas; Banderas Bay; Chamela Bay; Tenacatita Bay (183-D-2, also beach), 30 fathoms, sandy mud; Manzanillo (184-D-1, 2), 25-30 fathoms, sand, gravelly sand; Port Guatulco (195-D-2, 9, 17, 19, 20, 21, also beach), 3-23 fathoms, sand, gravelly sand, crushed shell, mud; Tangola-Tangola Bay (196-D-6, 7, 8, 14, also beach), 5-9 fathoms, sand, crushed shell; Nicaragua: Corinto (200-D-1, 3, 16, 17, 19, also beach), 2-13 fathoms, mangrove leaves; Costa Rica: Port Parker (203-D-1, 2, 3, also beach), 10-15 fathoms, sandy mud, crushed shell, algae; Culebra Bay; Port Culebra (206-D-1, 2, 3, also beach), 14 fathoms, sandy mud; Piedra Blanca Bay (208-D-1-10), 2-6 fathoms, rocks, sand, algae; Cedro Island, Gulf of Nicoya (213-D-1-10), 8-10 fathoms, mud, sand, crushed shell; Golfito, Gulf of Dulce (218); Panama: Gulf of Chiriqui (221-D-1-5), 35-40 fathoms, sandy mud.

*Description*: Both valves strongly arched; ornamented by 19 to 21 ribs, those on the right valve squarish, close-set, smooth, and those on the left narrower, flat-topped and with sloping sides; color light to dark brownish-red. The coloration of *P. circularis* is much more vivid than the more northern subspecies *aequisulcatus* which reaches a larger size when adult, has a thinner and flatter shell and narrower ribs. The subspecies is often colored with some pattern of brown while *circularis* is often ornamented with some pattern of red coloration.

*Distribution*: *Pecten circularis* was taken at many localities from Cedros Island to Panama, on the beach and at depths of 2 to 40 fathoms.

#### Subgenus *Lyropecten* Conrad.

Key to the species of *Lyropecten*.

- A. Right valve with 11 or 12 ribs, left with 10 or 11 ..... *subnodosus*  
 B. Right valve with 10 ribs, left with 9; lighter colored ..... *intermedius*

#### *Pecten (Lyropecten) subnodosus* Sowerby.

*Pecten subnodosus* Sowerby, *Proc. Zool. Soc. London*, October 9, 1835, p. 109. "Found in sandy mud and coral sand in from ten to seventeen fathoms." Three varieties; brownish-red with white striae, "ad Sinum Californiae"; var. variegated with brown

and white patches, "ad Insulam Platae, Columbiae Occidentalis;" var. with more depressed shell of a bright orange color, "ad Sinum Tehuantepec, Mexicanorum."—Reeve, *Conch. Icon.*, Vol. 8, *Pecten*, 1852, species 20, pl. 4, fig. 20. Mexico and west Colombia, in sandy mud and coral sand, at a depth of 10 to 17 fathoms.

*Type Locality*: Island of La Plata, Ecuador.

*Range*: Tres Marias Islands, Mexico, to Negritos, Peru.

*Collecting Stations*: Mexico: Banderas Bay; Chamela Bay, Passavera Island; Costa Rica: Port Parker; Culebra Bay; Panama: Bahia Honda, beach; Hannibal Bank, 35-40 fathoms, rocks, sand, coral, shells, mud, algae.

*Description*: Shell large, coarse, thick, right valve usually ornamented with 11 striated ribs, the left with 10, and occasionally there are 12 on the right valve and 11 on the left; the ribs are often nodose especially on the earlier part of the shell.

*Distribution*: This species occurs at various localities from the Tres Marias Islands to Paita, Peru. The exact northern limit is not known. It may occur in the Gulf of California but the form found there often has one less rib and is lighter colored.

#### *Pecten (Lyropecten) subnodosus intermedius* Conrad.

*Lyropecten intermedius* Conrad, *Amer. Jour. Conch.*, Vol. 3, Pt. 1, April 4, 1867, p. 7. "Cape St. Lucas, California."

*Pecten (Lyropecten) subnodosus* Sowerby, Arnold, U. S. Geol. Surv., Prof. Paper 47, 1906, p. 128, pl. 52, fig. 1; pl. 53, figs. 1, 1a. West coast of Mexico.

*Pecten (Lyropecten) nodosus* (Linnaeus) variety *intermedius* (Conrad), Grant and Gale, *Mem. San Diego Soc. Nat. Hist.*, Vol. 1, 1931, p. 181. Pliocene to Recent in the Gulf of California region.

*Type Locality*: Cape San Lucas, Lower California, Mexico.

*Range*: Scammon Lagoon to Cape San Lucas, and the Gulf of California; Clarion Island.

*Collecting Stations*: Mexico: Santa Inez Bay, beach; Arena Bank (136-D-6, 30), 35 fathoms, sand, weed; 3 miles off Pyramid Rock, Clarion Island (163-D-2), 55 fathoms, rock, coral.

*Description*: Shell usually with one rib less than that of *Pecten subnodosus*, lighter colored and often larger. There is some doubt as to the validity of this subspecies because the number of ribs is not constantly different from that of *P. subnodosus*. In general, however, the specimens from the west coast of Lower California and the Gulf of California show the features mentioned and for this reason the subspe-



cific name *intermedius* is retained at least for the present. A large specimen in the collections of the California Academy of Sciences from Scammon Lagoon, Lower California, measures 150 mm. from beak to base.

**Distribution:** This subspecies occurs at Scammon Lagoon, Cedros Island, Magdalena Bay and at Cape San Lucas, Lower California, as well as at many localities in the Gulf of California. The exact southern range is not known but it is known to occur as far south as Clarion Island and perhaps along the coast of Mexico some distance south of the Gulf of California. It occurs in shallow water.

#### Subgenus *Mesopeplum* Iredale.

##### *Pecten (Mesopeplum) fasciculatus* Hinds.

*Pecten fasciculatus* Hinds, Zool. Voy. *Sulphur*, Moll., Pt. 3, 1844 (date on cover of Pt. 3, January, 1845), p. 61, pl. 17, fig. 4. "West coast of Veragua. In seventeen fathoms among sandy mud."

*Pecten (Pallium) miser* Dall, *Bull. Mus. Comp. Zool.*, Vol. 43, No. 6, October, 1908, p. 401, pl. 8, fig. 6. "Gulf of Panama, in 182 fathoms, mud, bottom temperature 54°.1 F."

*Pecten (Decadopecten) fasciculatus* Hinds, Hertlein, *Proc. Calif. Acad. Sci.*, Ser. 4, Vol. 21, No. 25, September 26, 1935, p. 318, pl. 18, figs 1, 2. Earlier records cited.

**Type Locality:** West coast of Veragua, Panama, 17 fathoms, in sandy mud.

**Range:** Arena Bank, Gulf of California, to Panama.

**Collecting Stations:** Mexico: Arena Bank, Gulf of California (136-D-27, 28, 31) 35-85 fathoms, sand, muddy sand, rock, calcareous algae, weed; Gorda Banks, Gulf of California (150-D-4, 6, 16, 18, 23), 45-75 fathoms, muddy sand, sand, rocks, calcareous algae; Panama: Hannibal Bank (224), 35-40 fathoms, rocks, coral, sand, shells, algae.

**Description:** Shell with about a half dozen rounded ribs ornamenting each valve; ribs and interspaces ornamented by fine radial riblets, which are covered with fine concentric imbrications. In some specimens the ribs are flatter than in others. Color brownish-pink exactly as shown on the original illustration. Interiorly most of the specimens show vertical grooving along the hinge line and large specimens have well developed, grooved, cardinal crura. Irregular radial rounded riblets occur along the interior ventral margin. This margin is turned up especially in the right valve but sometimes that of the left is turned down to meet the right. The largest specimen at hand measures approximately 31.4 mm. from beak to base.

A study of these specimens leaves no doubt that the species described by Dall as *Pecten miser* is identical with *P. fasciculatus*.

The features of *Pecten fasciculatus* so closely resemble illustrations of *Mesopeplum caroli* Iredale,<sup>4</sup> the type of *Mesopeplum*, that we have referred it to that subgenus. It also closely resembles *Notochlamys anguineus* Finlay, the type of *Notochlamys*, which is said to differ from *Mesopeplum* only in lacking concentric sculpture.

**Distribution:** The present record of the occurrence of this species in the Gulf of California furnishes a long extension north in the range. It has been recorded as occurring in depths from 17 to 182 fathoms.

#### Subgenus *Leptopecten* Verrill.

Key to the species of *Leptopecten*.

- A. Every third rib (especially on the left valve) raised above the others
  - a. Ribs 16 ..... *velero*
  - aa. Ribs 12 ..... *biolleyi*
- B. Ribs of about equal elevation
  - a. Ribs square or subangular
    - b. Shell moderately thick, ears squarely offset from submargins ..... *tumbezensis*
    - bb. Shell thin, areas joining ears and submargins rounded ..... *latiauratus*
  - aa. Ribs 12-16 rounded corrugations of the shell ..... *monotimeris*

##### *Pecten (Leptopecten) latiauratus* Conrad.

*Pecten latiauratus* Conrad, *Jour. Acad. Nat. Sci. Philadelphia*, Vol. 7, 1837, p. 238, pl. 18, fig. 9. "Inhabits below the efflux of the tide near Sta. Diego and Sta. Barbara."

*Pecten (Chlamys) latiauratus* Conrad, Arnold, U. S. Geol. Surv., Prof. Paper 47, 1906, p. 115, pl. 46, figs. 2, 2a, 3, 3a. Monterey to San Diego, California. Also Pliocene and Pleistocene.

**Type Locality:** San Diego, California (according to I. S. Oldroyd, 1924).

**Range:** Off Point Reyes, California, to Cape San Lucas, Lower California.

**Collecting Stations:** Mexico: 5 miles west of San Jose Point, Lower California (175-D-1), 45 fathoms, slabs of slaty rock; east of Cedros Island (126-D-8, 9, 10, 11, 12, 15), 42-60 fathoms, mud, crushed shell and eel grass; also (127-D-1), 38 fathoms, mud.

**Description:** Shell small, thin, 12 to 16 square ribs; hinge line long, oblique; ears acutely pointed at termination of hinge line.

**Distribution:** This little pecten was dredged west of San Jose Point, at several localities east of Cedros Island, and a few were collected at Cape San Lucas, Lower California.

<sup>4</sup> *Mesopeplum caroli* Iredale, *Rec. Australian Mus.*, Vol. 17, No. 4, September 4, 1929, p. 162, pl. 38, figs. 7-9. "Type trawled in 55-60 fathoms off Montague Island, New South Wales."

***Pecten (Leptopecten) latiauratus monofimeris***  
Conrad.

*Pecten monofimeris* Conrad, *Jour. Acad. Nat. Sci. Philadelphia*, Vol. 7, 1837, p. 238, pl. 18, fig. 10. "Inhabits with the preceding" [=Inhabits below the efflux of the tide near Sta. Diego and Sta. Barbara]. "The young occasionally found attached to *Fuci* by a slender byssus."

*Pecten (Chlamys) latiauritus* var. *monofimeris* Conrad, Arnold, U. S. Geol. Surv., Prof. Paper 47, 1906, p. 131, pl. 46, figs. 4, 5, 5a. San Francisco and Santa Barbara to San Diego, California, Recent; also Pleistocene.

*Type Locality*: San Diego, California (according to I. S. Oldroyd, 1924).

*Range*: Monterey Bay, California, to Cape San Lucas, Lower California.

*Collecting Stations*: Mexico: East of Cedros Island (126-D-10), 60 fathoms, crushed shell and eel grass; Cape San Lucas.

*Description*: The rounded ribs which form broad corrugations of the shell, and the less acutely pointed ears, distinguish this subspecies from *P. latiauratus*.

*Distribution*: One specimen of *Pecten latiauratus monofimeris* was dredged east of Cedros Island and six typical specimens of this little kelp pecten were collected at Cape San Lucas, Lower California.

***Pecten (Leptopecten) tumbezensis*** d'Orbigny.

*Pecten tumbezensis* d'Orbigny, *Voy. Amér. Mérid.*, Vol. 5, 1846, p. 663. Tumbez, Peru. New name for *Pecten aspersionis* Sowerby, not *P. aspersionis* Lamarck.

*Pecten (Leptopecten) tumbezensis* d'Orbigny, Hertlein, *Proc. Calif. Acad. Sci.*, Ser. 4, Vol. 21, No. 25, September 26, 1935, p. 314, pl. 19, figs. 11, 12. Gulf of California to Tumbez and Paita, Peru. Also Quaternary of Peru.

*Type Locality*: Tumbez, Peru.

*Range*: Gulf of California, to Paita, Peru.

*Collecting Stations*: Mexico: Manzanillo (184-D-2), 30 fathoms, gravelly sand; Santa Cruz Bay (195-D-21), 18 fathoms, mud; Tangola-Tangola Bay (196-D-17), 23 fathoms, mud; Guatemala: 7 miles west of Champerico (197-D-1-2), 14 fathoms, mud; El Salvador: La Libertad (198-D-1-2), 13-14 fathoms, mud; Meanguera Island, Gulf of Fonseca (199-D-1), 16 fathoms, sand, mud, crushed shell; Nicaragua: Corinto (200-D-19), 12-13 fathoms, mangrove leaves; Monypenny Point, Gulf of Fonseca; Costa Rica: 14 miles S.E. of Judas Point (214-D-1-4), 42-61 fathoms, mud, shell, rocks; Panama: Gulf of Chiriqui (221-D-1-5), 35-40 fathoms, sandy mud.

*Description*: Shell fairly thick in proportion to the size, usually somewhat expanded posteriorly; ornamented by about 14 square ribs. The right valve is usually at least

partly white in color but the left valve is usually ornamented by a sprinkling of light bluish dots on a slate-colored or brown background. A large valve from Monypenny Point, Nicaragua, in the Gulf of Fonseca, measures 31.2 mm. from beak to base and 33.9 mm. in length.

*Distribution*: This species was dredged at a number of localities from off Manzanillo, Mexico, to Panama, in depths from 12 to 61 fathoms. It ranges south to Peru.

***Pecten (Leptopecten) velero*** Hertlein.

*Pecten (Leptopecten) velero* Hertlein, *Proc. Calif. Acad. Sci.*, Ser. 4, Vol. 21, No. 25, September 26, 1935, p. 316, pl. 19, figs. 13, 14. "Bahia Honda, Veragua, Panama, in three to nine fathoms."

*Type Locality*: Bahia Honda, Veragua, Panama, in 3 to 9 fathoms.

*Range*: Off Mazatlan, Mexico, to Panama.

*Collecting Stations*: Mexico: Manzanillo (184-D-2), 30 fathoms, gravelly sand; El Salvador: Meanguera Island, Gulf of Fonseca (199-D-1), 16 fathoms, sand, mud, crushed shell; Nicaragua: Corinto (200-D-1, 19), 6.5-13 fathoms, mangrove leaves.

*Description*: Shell small, ornamented by 16 ribs of which every third one is raised above the others, this is especially noticeable on the left valve. Toward the ventral margin of the right valve some specimens have well developed interribs and occasionally these also are present on the left valve.

*Distribution*: This species is known to occur off Mazatlan, Manzanillo, and Tres Marias Islands, Mexico, Meanguera Island, Gulf of Fonseca, El Salvador, Corinto, Nicaragua, and at Bahia Honda, Panama. It has been dredged in waters to a depth of 30 fathoms.

***Pecten (Leptopecten) velero biolleyi***

Hertlein and Strong, subsp. nov.

Plate I, Figure 6.

Shell small, rather thin, hinge long; color white and brown roughly arranged in concentric bands; anterior ear of right valve with large byssal notch and ctenolium, ornamented by three ribs; ventral margin broadly rounded; left ear large and broadly notched, ornamented by about four ribs; valve ornamented by about 12 to 13 rather high sharply triangular ribs which are separated by considerably wider interspaces, ribs and interspaces with strong, dense, fringing imbricating lamellae; when slightly worn the tops of the ribs are smooth; the ribs near the anterior and posterior margins are somewhat higher than the others and sometimes every third rib or pair of ribs is slightly raised; left valve similar to right except that it lacks the large byssal notch and the right ear is ornamented by about 4 or 5 ribs and the left ear is orna-



mented by 5 or 6 ribs; on some left valves every third rib is raised higher than the intervening ones. Length, 6.9 mm.; height, 6.6 mm.

Holotype, right valve, and paratypes (Calif. Acad. Sci. Paleo. Coll.), from Station 203-D-3, dredged in 12 fathoms (22 meters) in Lat. 10°55'45"N., Long. 85°49'05"W., Port Parker, Costa Rica, on bottom of sandy mud and crushed shells. Several small specimens were dredged near the same locality at Station 203-D-1.

This form is described as a subspecies of *Pecten velero* Hertlein because occasional left valves have every third rib raised similar to that species. The new subspecies differs from *Pecten velero* in possessing fewer, stronger ribs, 12 as compared to 16, and in that every third rib is less strongly raised in relation to the others. *Pecten velero biolleyi* resembles *P. bellilamellatus* Arnold<sup>5</sup> a species described as a fossil from the Pliocene of California, but differs in possessing fewer ribs, only 12 or 13 as compared to 15 or 16. Our specimens bear a remarkable resemblance to Arnold's illustrations of *P. bellilamellatus* and possibly this new subspecies might be considered to be a living representative of that species. Arnold's species however, was described as possessing about 16 ribs whereas the present form is constant in its small size and in its ornamentation of 12 or occasionally 13 ribs. Compared to *Pecten latiauratus delosi* Arnold,<sup>6</sup> the new subspecies has fewer, wider spaced ribs.

This new subspecies is named for Paul Biolley, former professor of Natural History at San Jose de Costa Rica.

#### Subgenus *Delectopecten* Stewart.

##### *Pecten (Delectopecten) arces* Dall.

*Pecten (Pseudamusium) arces* Dall, *Proc. U. S. Nat. Mus.*, Vol. 45, June 11, 1913, p. 592. "Off Santa Barbara, California, in over 500 fathoms, muddy bottom."

*Pseudamusium arces* Dall, *Proc. U. S. Nat. Mus.*, Vol. 66, Art. 17, 1925, p. 24, pl. 27, fig. 4. "Off Santa Cruz Island, Calif., in 534 fathoms."

*Type Locality*: Off Santa Barbara, California, in over 500 fathoms, mud.

*Range*: Off Santa Cruz Island, California, to off Cedros Island, Lower California.

*Collecting Station*: Mexico: East of Cedros Island (126-D-12), 45 fathoms, crushed shell, mud.

*Description*: Shell small, thin, ornamented

<sup>5</sup> *Pecten (Chlamys) bellilamellatus* Arnold, U. S. Geol. Surv., Prof. Paper 47, 1906, p. 108, pl. 41, figs. 6, 6a, 7, 7a. "San Diego formation (Pliocene), Pacific Beach, San Diego County, Cal."

<sup>6</sup> *Pecten (Chlamys) latiauritus* Conrad var. *delosi* Arnold, U. S. Geol. Surv., Prof. Paper 47, 1906, p. 130, pl. 46, figs. 9, 9a, 10, 10a. "San Pedro formation (lower portion), Pleistocene, Deadman Island, near San Pedro, Los Angeles County, Cal." Also Recent.

by reticulated radial and concentric sculpture which where crossing forms a tiny spinule. The posterior ear forms an oblique angle with the hinge line similar to that of *Pecten randolphi* Dall rather than a nearly square angle as is the case in *P. vancouverensis*. Two left valves in the present collection appear to be the young of this species.

*Distribution*: This species has been recorded from off Santa Cruz Island and San Nicolas Island, California. The present specimens extend the known range of the species south to Cedros Island, Lower California.

#### Subgenus *Cyclopecten* Verrill.

##### Key to the species of *Cyclopecten*.

- A. Right ear of each valve with fine reticulate sculpture ..... *pernomus*  
 B. Right ear of each valve without reticulate sculpture ..... *catalinensis*

##### *Pecten (Cyclopecten) catalinensis* Willett.

*Pecten (Cyclopecten) catalinensis* Willett, *Nautilus*, Vol. 45, No. 2, October, 1931, p. 65, pl. 4, figs. 1 and 2. "Taken by the writer in 100 fathoms off White's Landing, north side of Catalina Island, California."

*Type Locality*: Off White's Landing, Catalina Island, California, in 100 fathoms.

*Range*: Catalina Island, California, to Cedros Island, Lower California.

*Collecting Station*: Mexico: East of Cedros Island (126-D-10), 60 fathoms, crushed shell and eel grass.

*Description*: Shell small, shining transparent, very fragile; right valve white, ornamented only by fine concentric lines of growth; the left valve with lines of growth which are crossed in the umbonal region by very fine wavy striae, also ornamented by irregular brown radial rays, in the type specimen about 20, in the present specimen about 15; ears on both valves nearly equal in size and ornamented by concentric lines of growth. A single small left valve in the present collection appears to be referable to this species.

The shell of *Pecten catalinensis* has more nearly equal ears, lacks the posterior sulcation and has different color markings from that of *P. cocosensis* Dall. Characters which assist in separating *P. catalinensis* from *P. pernomus* are the concentric rather than reticulate sculpture of the right ear of each valve, also the faint rather than well developed radial sculpture of the left valve.

*Distribution*: One valve of *Pecten catalinensis* was dredged by the Expedition east of Cedros Island, Lower California, in 60 fathoms. This is an extension south in the known range of the species.

##### *Pecten (Cyclopecten) pernomus* Hertlein.

*Pecten (Cyclopecten) rotundus* Dall, *Bull.*

*Mus. Comp. Zool.*, Vol. 43, No. 6, October, 1908, p. 404. "Panama Bay, in 29½ fathoms; also at station 2784, in 194 fathoms, mud, bottom temperature 51°. 9 F."

*Pecten (Cyclopecten) pernomus* Hertlein, *Proc. Calif. Acad. Sci.*, Ser. 4, Vol. 21, No. 25, September 26, 1935, p. 320, pl. 18, figs. 11, 12, 13. New name for *Pecten (Cyclopecten) rotundus* Dall, not *P. rotundus* von Hagenow.

*Type Locality*: Panama Bay, in 29½ fathoms, mud.

*Range*: Cedros Island, Lower California, to Panama.

*Collecting Stations*: Mexico: East of Cedros Island (126-D-10, 12), 45-60 fathoms, crushed shell, eel grass, mud; Arena Bank (136-D-29), 70 fathoms, rock, weed; Manzanillo (184-D-2), 30 fathoms, gravelly sand; Port Guatulco (195-D-19), 17 fathoms, green mud, crushed shell; Costa Rica: Port Parker (203-D-1, 3), 12-15 fathoms, sandy mud, crushed shell, shelly mud.

*Description*: The shell of this species is small, thin, suborbicular, with sub-equal ears. The right valve is ornamented by concentric striations; the anterior ear is ornamented by fine reticulate sculpture, a byssal notch is present, the posterior ear smooth; valve colored white or ornamented by small white and brown spots. The left valve is radially striated, the striae bifurcating toward the ventral margin; the ears are subequal, the left the larger of the two, both finely radially striated and crossed by fine concentric sculpture; color white and often ornamented by brownish spots or by large V-shaped brownish areas pointing toward the beaks.

A study of the specimens in the present collection and of those collected by George Willett from off western Mexico has convinced us that these should be referred to *Pecten pernomus* Hertlein. The records from California Academy of Sciences localities numbers 23,779, 23,804, 25,527, 27,581, 27,584, 27,587, cited by Hertlein (1935) under *Pecten (Cyclopecten) cocosensis* Dall, can be referred to *P. pernomus*. The suborbicular shape and absence of the posterior sulcation as well as the larger ears and strong radial ornamentation of the left valve all serve to separate this species from *P. cocosensis* Dall.

*Distribution*: This species occurs fairly abundantly at some localities off southern Mexico and off Nicaragua. It occurs as far north as Cedros Island and south to the bay of Panama. Dall mentioned that a single valve from near the Straits of Magellan was apparently identical with *Pecten rotundus* Dall [= *pernomus*]. We have not seen specimens from that region but it seems unlikely that the species occurs that far south.

## FAMILY SPONDYLIDAE.

Key to the genera of the Spondylidae.

- A. Shell with auricular areas each side of umbo ..... *Spondylus*  
 B. Shell without auricular areas each side of umbo ..... *Plicatula*

Genus *Spondylus* Linnaeus.

*Spondylus princeps* Broderip.

*Spondylus princeps* Broderip, *Proc. Zool. Soc. London*, May 17, 1833, p. 4. "Hab. ad Insulam Platam Columbiae Occidentalis." "Found attached to coral rocks at the depth of seventeen fathoms."—Reeve, *Conch. Icon.*, Vol. 9, *Spondylus*, 1856, species 9, pl. 2, fig. 9. Original locality cited.

*Spondylus leucacantha* Broderip, *Proc. Zool. Soc. London*, May 17, 1833, p. 5. "Hab. ad Insulam Platam."—Reeve, *Conch. Icon.*, Vol. 9, *Spondylus*, 1856, species 6, pl. 2, fig. 6. Original locality cited.

*Type Locality*: Island of Plata, Ecuador, in 17 fathoms, attached to coral rocks.

*Range*: Scammon Lagoon, and the Gulf of California, to Negritos, Peru.

*Collecting Stations*: Mexico: Arena Bank (136-D-2, 4, 11), 30-45 fathoms, mud, *Arca* conglomerate, rock; Santa Inez Bay; Costa Rica: Port Culebra; Piedra Blanca; Panama: Bahia Honda; Colombia: Gorgona Island.

*Description*: Shell with radial rows of long spines; color white with red near the umbos, orange, or entirely red, interior white, border sometimes red or orange.

There is some doubt as to the earliest correct name for this species. It has generally been attributed to *Spondylus crassi-squama* Lamarck<sup>7</sup>. Lamarck referred to Recent specimens stated to occur in "les mers de l'Inde" and to fossil forms from "Fossil à Carthage d'Amérique." Favre<sup>8</sup>, who has given illustrations of Lamarck's fossil specimens, stated that Lamarck's Recent specimens can be referred to *S. pictorum* Chemnitz but that the name *crassi-squama* should apparently be restricted to the fossil form from Colombia. *Spondylus pictorum* Chemnitz<sup>9</sup> has been considered by some authors to be the earliest name for the Recent west American form but the type locality of the species is given as the Mediterranean Sea and the Aegean

<sup>7</sup> *Spondylus crassi-squama* Lamarck, *Hist. Nat. Anim. s. Vert.*, Vol. 6, February-June, 1819, p. 191. "Habite les mers de l'Inde." Also "On le trouve fossile à Carthage d'Amérique." References to "Rumph. Mus. t.48, fig.1." and "Encyclop. pl.192. f.2." Also "[b] *Squamis palmatis*. Seba, Mus. 3. t.88. f.10."

<sup>8</sup> Favre, J., *Mus. d'Hist. Nat. Genève Cat. Illustr. Coll. Lamarck, Conch. Monomyaires foss.* 1918, II Sec., pl. 12, figs. 39a, 39b, 39c. "Le *S. pictorum* semble être une mutation plus ornémentée du *S. crassi-squama* fossile, et il paraît indiqué de restreindre au type éteint le nom que Lamarck avait appliqué indistinctement aux deux formes parentes."

<sup>9</sup> *Spondylus pictorum* Chemnitz, *Neus Syst. Conch.-Cab.*, Bd. 7, 1784, p. 94, suppl. pl. 69, figs. E. F. "Sie wohnt im mittelländischen Meere, und vorzüglich nach Aristotelis Aussage im ägeischen Meere, welches heut zu Tage der griechische Archipelagus heist."



Sea. Pfeiffer<sup>10</sup> referred Chemnitz's figures "E." and "F." of *Spondylus pictorum* to *Spondylus gaederopus* of Gmelin. Some writers do not accept as valid the names of species proposed by Chemnitz.\* However, his names appear to deserve acceptance far more than those of some authors whose names have been accepted but whose strict use of binomial nomenclature may be open to question. In any case the name *Spondylus princeps* Broderip without doubt was applied to the Recent west American *Spondylus* which also has been cited in the literature as *S. dubius* Broderip and *S. leucacantha* Broderip. D'Orbigny (1846) considered *S. leucacantha* to be only an adult variety of *S. princeps*. *Spondylus limbatus* Sowerby, erroneously cited from the Gulf of California by some authors, was originally described from the Persian Gulf.

*Spondylus calcifer* Carpenter<sup>11</sup>, the only other species of *Spondylus* living in west American waters, possesses a very thick shell which is less coarsely spinose than that of *S. princeps*, and is colored along the interior margin by a deep reddish-purple band. It has been reported to range from Concepcion Bay in the Gulf of California to Panama. It is sometimes burned for lime in regions where it is abundant.

*Distribution*: *Spondylus princeps* occurs at various localities from Scammon Lagoon, Lower California, to Peru. Most of the specimens in the present collection were worn beach specimens or imperfect dredged specimens.

#### Genus *Plicatula* Lamarck.

Key to the species of *Plicatula*.

- A. Shell small, thin, finely radially ribbed ..... *penicillata*  
 B. Shell large, thick, coarsely radially plaited ..... *spondylopsis*

#### *Plicatula penicillata* Carpenter.

*Plicatula penicillata* Carpenter, Cat. Mazatlan Shells, February, 1856, p. 155. "Hab.

<sup>10</sup> Pfeiffer, L., Kritisches Register zu Martini und Chemnitz's Syst. Konch.-Kab., p. 73, (Kassel), 1840.

\* Since this paper was submitted for publication the International Commission on Zoological Nomenclature has ruled against acceptance of the specific and subspecific names in Volumes 1-11 of Martini and Chemnitz, Neues Systematisches Conchylien-Cabinet, Nürnberg, 1769-1795. (See "Opinions and Declarations rendered by the International Commission on Zoological Nomenclature", Vol. 3, Pt. 3, Opinion 184. Summary, p. 27. "No new specific or subspecific trivial name published in these volumes has any status in nomenclature." Also p. 34. Issued October 17, 1944).

<sup>11</sup> *Spondylus calcifer* Carpenter, Cat. Mazatlan Shells, February, 1856, p. 152. "Hab.—Bay of Panama, in a few fathoms of water, Cuming; C. B. Adams.—La Paz; Lieut. Green.—Mazatlan; not uncommon."

This species appears to be the one illustrated by Reeve under the name *Spondylus radula* (Conch. Icon., Vol. 9, *Spondylus*, May, 1856, species 52, pl. 14, fig. 52. "Hab. Tehuantepec, West Mexico; Captain Dare.") The combination of names *Spondylus radula* was used by Lamarck in 1806, therefore Reeve's species was renamed *Spondylus smithi* by Fulton (Journ. Conch., Vol. 14, No. 12, October 1, 1915, p. 357).

—Bay of Fonseca, Cuming.—Mazatlan; extremely rare, on shells."—Sowerby, Conch. Icon., Vol. 19, *Plicatula*, 1873, species 3, pl. 1, fig. 3. North America.

*Type Locality*: Mazatlan, Mexico (here designated). Gulf of Fonseca also originally cited.

*Range*: Gulf of California to Panama.

*Collecting Stations*: Mexico: Port Guatulco (195-D-9), 7 fathoms, sand, crushed shell; Nicaragua: Corinto (200-D-19), 12-13 fathoms, mangrove leaves.

*Description*: Shell small, suborbicular or irregular in shape, thin, finely ribbed or sculptured by fine radial rows of hollow spines; some specimens are ornamented exteriorly by small brown spots; the interior of the shell is often colored by dark brown spots or stripes especially around the margin, which is denticulated. A large specimen measures approximately 15 mm. from beak to base.

*Distribution*: This species has been recorded between Cape Pulmo and Cape San Lucas, Lower California, Mazatlan, Mexico, Nicaragua, and Panama. Specimens in the present collection were dredged at depths of 7 to 13 fathoms.

#### *Plicatula spondylopsis* Rochebrune.

Plate I, Figures 15 and 16.

*Plicatula spondylopsis* Rochebrune, Bull. Mus. Nat. Hist. Nat. Paris, Vol. 1, 1895, p. 242. "Lagunes des îles de San Jose." Gulf of California.—Lamy, Jour. de Conchyl., Vol. 83, No. 1, 1939, p. 23. Lower California.

*Type Locality*: San Jose Island, Gulf of California, in lagoon.

*Range*: San Jose Island, Gulf of California, to Ecuador, and the Galápagos Islands.

*Collecting Stations*: Arena Bank (136-D-5, 26), 33-45 fathoms, sand, weed, crushed shell; Gulf of California.

*Description*: Shell roughly trigonal in shape, thick, ornamented by coarse radial plaited sculpture, which however may be partially or almost wholly absent on some specimens; two hinge teeth in each valve. In perfect shells the exterior is colored purple and the interior white, with dark spots around the corrugated margin. Muscle scar nearer the posterior margin. A very narrow space between the valves is occupied by the animal.

*Plicatula ostreivaga* Rochebrune is a synonym.

This species has been cited from west American waters under the name *Plicatula dubia* Hanley. At the time of original description *Plicatula dubia*<sup>12</sup> was cited from both the Philippine Islands and from the

<sup>12</sup> *Plicatula dubia* Hanley in Sowerby, Thes. Conch., Vol. 1, p. 437, pl. 90, fig. 12?; pl. 91, fig. 19, 1847. "Collected by Mr. Cuming at the Island of Samar, and at the Island of Cana, West Colombia."

Island of "Cana," west Colombia. Later writers including Hanley<sup>13</sup>, Sowerby<sup>14</sup>, Hidalgo<sup>15</sup>, and Lamy considered it to be a Philippine species. Lamy<sup>16</sup> pointed out that an island of the name of "Cana" occurs in the Philippine Archipelago but that no island of that name is known from western South America. There is, however, an island of "Cano" in the Gulf of Nicoya and another island of the same name in the Gulf of Dulce, Costa Rica. It is uncertain whether either of these may have been the island to which Hanley referred. It appears then that the correct name for the west American species considered here is *Plicatula spondyloopsis* Rochebrune.

*Plicatula spondyloidea* Meuschen<sup>17</sup>, a Caribbean species, is very similar to the west American form.

*Distribution: Plicatula spondyloopsis* occurs from the Gulf of California to Ecuador and the Galápagos Islands, in rather shallow water. It also occurs from Pliocene to Recent in the same region.

#### FAMILY DIMYIDAE.

##### Genus *Dimya* Rouault.

*Dimya* Rouault, *Mem. Soc. Geol. France*, Ser. 2, Vol. 3, Pt. 2, 1848, p. 470 (Mem. No. 7, p. 14). Sole species, "*Dimya Deshayesiana*, Nob.", p. 471 (Mem. No. 7, p. 15), pl. 15 (Mem. No. 7, pl. B), figs. 3, 3a, 3b. "Bos d'Arros," France, Eocene.—Stoliczka, *Mem. Geol. Surv. India. Palaeont. Indica*, Ser. 6, Cret. Fauna South. India, Vol. 3, 1871, pp. XXII, 397. "Type, *D. Deshayesiana* Rouault, from Eocene beds at Bos d'Arros, France."—Dall, *Bull. Mus. Comp. Zool.*, Vol. 12, No. 6, 1886, p. 227. "Type *Dimya Deshayesiana* Rouault."

Not *Dimya* Menke, *Syn. Meth. Moll.*, 1830, p. 101. "Subordo 2. *Dimya*. (*Dimyaires*, Fér.)" Not *Dimya* F. Moore, 1881. *Lep. Noctuid*.

*Margariona* (Dall MS), Kobelt, *Nachrichtsbl. Malakozool. Gesell.*, Vol. 14, Nos. 11 and 12, November-December, 1882, p. 186. [No species cited, but it was placed in the synonymy of *Dimya* by Dall in 1886].

*Deuteromya* Cossmann, *Rev. Crit. de Palaeozool.*, Vol. 7, 1903, p. 68. A new name for *Dimya* Rouault, not *Dimya* Menke.—Cossmann and Peyrot, *Act. Soc. Linn. Bordeaux*, Vol. 68, 1914, p. 409. "(G.-T.: *Dimya Deshayesiana* Rouault, Eoc.)"

*Type* (by monotypy): *Dimya deshayesiana* Rouault. Eocene of France. Illustrated

<sup>13</sup> Hanley, S., *Cat. Rec. Biv. Shells*, 1856, p. 289. "Philippines."

<sup>14</sup> Sowerby, G. B., *Conch. Icon.*, Vol. 19, *Plicatula*, 1873, species 13, pl. 4, fig. 13. "Hab. Isl. Samar, Philippines."

<sup>15</sup> Hidalgo, J. G., *Cat. Mol. Test. Islas Filipinas*, 1904-1905, p. 385.

<sup>16</sup> Lamy, E., *Journ. de Conchyl.*, Vol. 83, No. 1, 1939, p. 17.

<sup>17</sup> See Lamy, E., *Journ. de Conchyl.*, Vol. 83, No. 1, 1939, p. 19.

by Rouault, 1848, pl. 15, figs. 3, 3a, 3b. Also, Tryon, *Struct. and Syst. Conch.*, Vol. 3, 1884, p. 281, pl. 132, figs. 80 and 81. Eocene; Pau.—Fischer, *Man. de Conchyl.*, 1886, p. 936, fig. 704.

Shell small, irregularly orbicular, adhering by the right valve which is larger than the left, compressed, externally nacreous, internally porcellanous; umbones slightly projecting, subcentral; surface smooth or with fine radial ornamentation or sculptured similar to the object to which it adheres; external ligament slender, linear; interior ligament in a small triangular pit. Interior white; anterior and posterior muscle scars present, the posterior one larger and double; pallial line simple; inner margin radiately wrinkled.

We have used the genus name *Dimya* Rouault although the name *Dimya* was also used by Menke in 1830 as a name for a suborder as follows: "Subordo 2. *Dimya*. (*Dimyaires*, Fér.)" If *Dimya* is not available as a generic name then the name *Margariona* Dall in Kobelt is applicable. Kobelt in 1882 mentioned that Dall intended to name a genus *Margariona* for a species of *Dimyidae* dredged in the Caribbean region. No species was cited by Kobelt and *Margariona* was thus originally a genus without species. In 1886 Dall placed *Margariona* in the synonymy of *Dimya* whose type was cited as *Dimya deshayesiana* Rouault. If *Dimya* Rouault proves to be invalid, Dall's action would make *Margariona* Dall in Kobelt a valid genus with the same type, *Dimya deshayesiana* Rouault. Cossmann in 1903 proposed *Deuteromya* as a new name for *Dimya* Rouault (not *Dimya* Menke). There is also a *Dimya* F. Moore, 1881, in *Lepidoptera*. *Dimyarina* Iredale has been proposed with the type, *Dimya corrugata* Hedley, a Recent species from Australia.

Species referred to the genus *Dimya* have been described from beds of Cretaceous age in Africa and in Mexico. Probably most of the forms which have been attributed to *Dimya* in the earlier Mesozoic belong to other genera such as *Dimyodon* Munier-Chalmas, the type of which is *D. schlumbergeri* Munier-Chalmas. That genus as pointed out by Dall "is characterized chiefly by its undivided posterior adductor scar, the tooth-like crura being present though feeble in the typical *Dimya*." *Dimyopsis* Bittner with the type *Dimyodon intusstriata* Emmrich is a related genus in the Triassic.

Species of *Dimya* have been described from the Tertiary of Australia, New Zealand, East Indies and Europe. The genus is represented at the present time in the waters of Australia, New Zealand, East Indies, Philippine Islands, Japan, Hawaii, southern California and northern Mexico, and the Caribbean Sea.



*Dimya californiana* Berry.

Plate I, Figure 17.

*Dimya californiana* Berry, *Proc. Malac. Soc. London*, Vol. 22, Pt. 3, November 14, 1936, p. 126, pl. 13B, figs. 1, 2, 3, 4. "100 fathoms, off Santa Monica, California; specimen obtained from a stone taken by fishermen (W. H. Golisch, summer 1918)."

*Type Locality*: Off Santa Monica, California, in 100 fathoms, on a stone.

*Range*: Santa Monica, California, to Ceralbo channel, Gulf of California.

*Collecting Station*: Mexico: Ceralbo channel, Gulf of California (137-D-2), 46 fathoms, rock.

*Description*: Shell small, suborbicular, rather flat, outer surface irregularly laminated somewhat like mica; cardinal crura continuous above a small, roundly-triangular pit-like socket for the resilium; a line of denticles occurs just inside of where the valves impinge upon each other.

A single left valve of a *Dimya* dredged in Ceralbo channel in the Gulf of California agrees with the description and illustrations of *Dimya californiana* Berry. Somewhat similar species are *Dimya filipina* Bartsch and *D. lima* Bartsch, from the Philippine Islands, and *D. mimula* Dall, Bartsch & Rehder, from the Hawaiian Islands. Berry has recently described *Dimya coralliotis* from southern California (*Proc. Malacol. Soc. London*, Vol. 26, Pt. 1, May 4, 1944, p. 25, figs. 1-4).

*Distribution*: The single specimen of this species dredged in 46 fathoms in Ceralbo channel in the Gulf of California is the only record of this species from Mexican waters.

FAMILY LIMIDAE.

Genus *Lima* Cuvier.

Key to the species of *Lima*.

- A. Shell large, thick, with coarse radial ribs ..... *tetrica*
- B. Shell small, thin, with fine radial ribs
  - a. Shell with a central longitudinal sulcus ..... *subauriculata*
  - aa. Shell without a central longitudinal sulcus
    - b. Shell narrowly elongate, slightly convex, widely gaping on both sides ..... *pacifica*
    - bb. Shell ovately elongate, decidedly convex, gaping wider anteriorly than posteriorly
    - c. Widest part of shell at about the middle of the anterior margin ..... *orbignyi*
    - cc. Widest part of shell above the middle of the anterior margin ..... *hemphilli*

Subgenus *Lima* s.s.

*Lima (Lima) tetrica* Gould.

*Lima tetrica* Gould, *Proc. Boston Soc. Nat. Hist.*, Vol. 4, November, 1851, p. 93. "Gulf of California, La Paz. Maj. Rich."—Gould, *Boston Jour. Nat. Hist.*, Vol. 6, 1857, p. 405, pl. 16, fig. 6. La Paz, Gulf of California.

*Type Locality*: La Paz, Lower California, Mexico.

*Range*: Espiritu Santo Island, in the Gulf of California, to Gorgona Island, Colombia.

*Collecting Stations*: Mexico: Port Guatulco (195-D-9), 7 fathoms, gravel, sand and crushed shell; Tangola-Tangola Bay (196-D-14, 15), 5 fathoms, crushed shell; Costa Rica: 14 miles S. × E. of Judas Point (214-D-1-4), 42-61 fathoms, mud, shell, rock.

*Description*: Shell obliquely ovate, triangular, thick, dull white, with eighteen radiating ribs covered with long, semi-erect, muricated scales, longest at the posterior margin. The muscle scar is nearer the posterior margin. The shell attains a height of at least 50 mm.

*Lima tetrica* belongs to a group of species which occur in the warm marine waters of the world. This group is typified by *Lima lima*, the type of the genus which is probably a Mediterranean species.

*Distribution*: *Lima tetrica* occurs in comparatively shallow water, from the Gulf of California to Colombia. It is also known to occur in the Pleistocene of Oaxaca, Mexico.

Subgenus *Promantellum* Iredale.

*Promantellum* Iredale, *Brit. Mus. (Nat. Hist.) Great Barrier Reef Exped. 1928-1929. Sci. Repts.*, Vol. 5, No. 6, Moll., Pt. 1, February 25, 1939, p. 385. "Type: *P. parafragile* sp. nov.," p. 386, pl. 6, figs. 10, 10a. "Low Isles," Great Barrier Reef, Australia.

*Type* (by original designation): *Promantellum parafragile* Iredale.

Shell very thin and oblique, flattened, equivalve, inequilateral, widely gaping both anteriorly and posteriorly, hinge line oblique and short, ears small, the anterior the larger and pointed; sculpture of low, sharp, slightly scaly, radial ribs which are separated by wider interspaces; ligament short and broad; free swimming. Exteriorly the general characters of the shells of *Promantellum* are somewhat like those of *Limatulella* Sacco<sup>18</sup>, but the valves gape widely while those of *Limatulella*, which is typified by *Lima loscombi* Leach in Sowerby, gape only slightly along the upper anterior dorsal margin.

<sup>18</sup> *Limatulella* Sacco, *Moll. Piemonte e Liguria*, Pt. 25, August, 1898, p. 16. "(tipo *L. Loscombi* (Sow.))." ["*Lima Loscombi*, Leach," G. B. Sowerby, *Gen. Shells*, Vol. 1, 1823, *Lima*, pl. 99, fig. 4 (cited on plate as *L. loscombi*). Coast of Devonshire, England. Also illustrated by Forbes & Hanley, *Hist. Brit. Moll.*, Vol. 2, 1853, p. 265, pl. 53, figs. 1, 2, 3. Various localities about Gt. Britain. Ranges throughout the European seas.]

***Lima (Promantellum) pacifica* d'Orbigny.**

*Lima arcuata* Sowerby, Thes. Conch., Vol. 1, 1843, p. 86, pl. 22, figs. 41 and 42. [The date on the title page is 1842, but according to Sherborn this part was issued prior to June 23, 1843]. "at Panama in sandy mud; at Guayaquil Bay; at Guacomayo, under stones, etc. by Mr. Cuming." [Not the record "Found at Lord Hood's Island, under coral rocks," but it does occur at Hood Island, Galápagos group].

Not *Lima arcuata* Geinitz, 1840.

*Lima pacifica* d'Orbigny, Voy. Amér. Mérid., Vol. 5, 1846, p. 654. "M. Cuming l'a rencontrée près de Guayaquil, république de l'Équateur, et à Panama." New name for *Lima arcuata* Sowerby, not *Lima arcuata* Geinitz.

**Type Locality:** Panama, in sandy mud (here designated as type locality). Bay of Guayaquil, Ecuador, Guacomayo, and Lord Hood's Island also cited originally.

**Range:** Punta Penasco, Sonora, Mexico, to Negritos, Peru, and the Galápagos Islands.

**Collecting Station:** Costa Rica: Piedra Blanca.

**Description:** Shell thin, rather narrowly elongate, and somewhat expanded ventrally, widely gaping, the valves in contact only along the hinge and base; ornamented by about 30 to 35 fine, slightly wavy, radial ribs which bear very fine scales; the ribs become finer and more closely spaced anteriorly and posteriorly. A fairly large valve measures approximately: height 27 mm., length 17 mm., convexity (one valve) 5 mm.

*Lima galapagensis* Pilsbry and Vanatta<sup>19</sup> appears to be identical with this species.

**Distribution:** *Lima pacifica* is found occasionally from the Gulf of California to Peru and the Galápagos Islands. It occurs under rocks at extreme low tide.

### Subgenus *Limaria* Link.

*Limaria* Link, Beschreib. Nat.-Samml. Univ. Rostock, Abt. 3, May 17, 1807, p. 157. —Winckworth, Proc. Malacol. Soc. London, Vol. 19, Pt. 3, November, 1930, p. 116. "I here choose *inflata* as type . . ."

**Type** (by subsequent designation): *Limaria inflata* of Link founded on Chemnitz, Conchyl.-Cab., Bd. 7, 1784, pl. 68, fig. 649a [cited as 641a by Link]. From the "Küste von Guinea und an den Stranden der westindischen Zuckerinseln."

Shell moderately thin, oblique, somewhat produced anteriorly toward the ventral margin, submargins not impressed, usually somewhat inflated and gaping; ornamented by rather fine ribs of variable strength,

often scaly; ligament pit broadly triangular; foot without byssus or retractor.

*Limaria* is available for most of the species formerly attributed to *Mantellum* Mörch which is not available due to earlier use of that name by Bolten.

Winckworth designated *Lima inflata* of Link as type, based on fig. 649a [cited as 641a by Link] of Chemnitz. Iredale rejected this selection, stating that *vulgaris* of Link (based on fig. 651 of Chemnitz, and under which Link included as a synonym *Ostrea lima* Linnaeus) should be the type by tautonymy, thus making *Limaria* a synonym of *Lima*. However, according to the rules of the International Commission on Zoological Nomenclature (Article 30(m)) it is recommended that names such as *vulgaris*, *communis*, etc., in the original list of species accompanying a genus, should be given preference but it is not stated that they must be selected as type.

*Ostrea lima* Linnaeus is cited in the synonymy of *vulgaris* Link, but the specific name *lima* is not absolutely tautonymous with *Limaria* but only virtually tautonymous. According to the rules of nomenclature a type by subsequent designation takes precedence over designation by virtual tautonymy. For these reasons we have retained *Limaria* with the type *inflata* based on Chemnitz's figure 649a as designated by Winckworth.

Iredale pointed out that *Lima inflata* of Gmelin, based on Chemnitz's figure 649b, represents a different species (*bullata* Born).

Species of *Limaria* have been recorded from the Neocomian, lower Cretaceous, to Recent. At the present time species occur at various depths in the waters of the temperate and tropical latitudes.

### *Lima (Limaria) hemphilli*

Hertlein & Strong, sp. nov.

Plate I, Figures 3 and 4.

*Lima dehiscens* Conrad cited in west American records. Not *Lima dehiscens* Conrad, 1837. Island of Fayal, Azores.

**Description:** Shell obliquely elliptical, equivalve, inequilateral, moderately convex, broadly gaping especially along the anterior dorsal margin, posteriorly narrowly gaping; hinge short, anterior ear the larger, pointed, and beneath which a notch is present; the maximum width of the anterior margin is above the middle of the shell; between the widest portion and the hinge the margin shows two vague angulations; ventral margin elliptical, posterior margin very gently rounded; the anterior umbonal slope of the valves is gentle, the posterior slope is rather abrupt; valves ornamented by fine irregular radial ribs which are crossed by very

<sup>19</sup> *Lima galapagensis* Pilsbry & Vanatta, Proc. Washington Acad. Sci., Vol. 4, September 30, 1902, p. 556, pl. 35, fig. 4. "Tagus Cove, Albemarle" Island, Galápagos Islands.



fine imbricating lirae; anterior and posterior submargins smooth. Height 23 mm., length 16.4 mm., convexity (both valves) approximately 12 mm.

Holotype and paratype (Calif. Acad. Sci. Paleo. Type Coll.) from Loc. 5955 (C.A.S.), San Diego, California; Henry Hemphill collector.

This species has been cited in the west American records as *Lima dehiscens* Conrad<sup>20</sup>, a species originally described from the island of Fayal in the Azores. Sowerby<sup>21</sup> later considered Conrad's species to be synonymous with *Lima fragilis* Chemnitz<sup>22</sup> which was described originally from the coast of Nicobar.

Carpenter<sup>23</sup> in 1864 cited *Lima orientalis* Adams and Reeve from California and cited Cooper as authority that the species was identical with *Lima dehiscens*. *Lima orientalis* Adams and Reeve<sup>24</sup> was originally described from the Philippine Islands and is a distinct species.

From a consideration of the facts it appears to us that the west American species is without a valid name. It is here named in honor of Henry Hemphill who made extensive collections of mollusks in western North America.

*Lima hemphilli* greatly resembles the east American species generally referred to *Lima inflata* Lamarck<sup>25</sup>. The west American form appears to be wider in proportion to the length in comparison with the east coast specimens which we have seen, but they are very similar.

Compared to *Lima hians*, the width of *L. hemphilli* is proportionally greater, the widest part of the shell is somewhat farther above the middle and there are two vague angulations along the anterior dorsal outline rather than a correspondingly straight marginal outline in *L. hians*. Furthermore the anterior slope in *L. hemphilli* is steeper than that of *L. hians*.

Compared to *Lima hemphilli* the shell of *L. hirasei* Pilsbry<sup>26</sup> is flatter, the radial sculpture is finer, and the anterior and

posterior dorsal margins are flattened and gently upturned. Thiele<sup>27</sup> considered *L. hirasei* to be only a variety of the West American species.

*Range*: Monterey, California, to Acapulco, Mexico.

*Distribution*: *Lima hemphilli* occurs from Monterey, California, to off western Mexico in waters from 10 to 50 fathoms and perhaps at greater depths. A single specimen of this species was dredged by the Crocker-Beebe expedition southeast of Cedros Island, in the channel, (126-D-19), in 25 fathoms, rocks, algae. It is also known from Pliocene to Recent and a similar or identical form has been recorded from the upper Miocene of southern California.

#### *Lima (Limaria) orbignyi* Lamy.

*Lima angulata* Sowerby, Thes. Conch., Vol. 1, 1843, p. 86, pl. 22, figs. 39, 40. [The date on the title page is 1842 but according to Sherborn this part was issued prior to June 23, 1843]. "Found by Mr. Cuming at Panama and the Bay of Caracas, in sandy mud, 10 to 12 fathoms."—Prasad, Siboga Exped., Monogr. 53c, Lamell., 1932, pp. 125-126 (in text), pl. 3, figs. 34, 35. Panama.

Not *Lima angulata* Münster, 1841.

*Lima (Mantellum) orbignyi* Lamy, Jour. de Conchyl., Vol. 74, No. 3, November 29, 1930, p. 180. New name for *Lima angulata* Sowerby, not *L. angulata* Münster.

*Type Locality*: Panama, in 10 to 12 fathoms, sandy mud (here designated). Bay of Caracas, Ecuador, also cited originally.

*Range*: Punta Penasco, Sonora, Mexico, to Juan Fernandez Island, and the Galápagos Islands.

*Collecting Stations*: El Salvador: La Union, Gulf of Fonseca (199-D-8, 22), 3-6 fathoms, mud, mangrove leaves on bottom; Nicaragua: Monypenny Point, Gulf of Fonseca (199-D-6), 4 fathoms, mud; Potosi Island; Costa Rica: Port Parker (203-D-3), 12 fathoms, shelly mud.

*Description*: Thin, striated, ventricose, slightly gaping on both sides, obliquely oval, with a posterior angle between the lateral and ventral margin, hinge narrow, auricles small, nearly equal (Sowerby). The valves gape widest along the dorsal portion of the anterior margin.

A large specimen of this species from Panama in the collection of Stanford University measures approximately 32 mm. in altitude and 24 mm. in width.

*Lima orbignyi* in some cases has been cited from west American waters under the name of *Lima orientalis* Adams and Reeve. The species described by Adams and Reeve

<sup>20</sup> *Lima dehiscens* Conrad, Jour. Acad. Nat. Sci. Philadelphia, Vol. 7, 1837, p. 247, pl. 19, fig. 7. "Inhabits the rocky coast of the island of Fayal; rare."

<sup>21</sup> Sowerby, Jun., G. B., Thes. Conch., Vol. 1, *Lima*, 1843, p. 86.

<sup>22</sup> *Pecten fragilis*, Chemnitz, Conchyl.-Cab., Vol. 7, 1784, p. 349, pl. 68, fig. 650. "Diese seltene Muschel ist an den Nicobarischen Stranden gefunden worden."

<sup>23</sup> Carpenter, P. P., Rept. Brit. Assoc. Adv. Sci. for 1863 (issued August, 1864), pp. 612, 645. Reprint in Smithsonian. Miscell. Coll., No. 252, 1872, pp. 98, 131.

<sup>24</sup> *Lima orientalis* Adams and Reeve, Zool. Voy. Samarang, August, 1850, Moll., p. 75, pl. 21, fig. 7. "Hab. Philippine Archipelago."

<sup>25</sup> See Perry, L. M., Bull. Amer. Paleo., Vol. 26, No. 95, August 12, 1940, p. 44, pl. 6, fig. 31. Florida.

<sup>26</sup> *Lima hirasei* Pilsbry, Proc. Acad. Nat. Sci. Philadelphia, Vol. 53, May 7, 1901, p. 209. "Hirado, prov. Hizen, Kiusiu, Japan (Mr. Hirase)."—Pilsbry, Proc. Acad. Nat. Sci. Philadelphia, Vol. 53, p. 402, pl. 19, fig. 12 (as *Lima hians* Gmelin var. *hirasei* Pilsbry).

<sup>27</sup> Thiele, J., Martini—Chemnitz Conchyl.-Cab., Bd. 7, Abt. 2a, Heft 22, 1920, Limidae, p. 32, pl. 5, fig. 4. Pacific Ocean (Kiusiu, Japan).

occurs in the East Indies and is distinct from the west American shell.

*Distribution*: This species occurs from the Gulf of California to Juan Fernandez Island. Specimens in the present collection were dredged from depths of 3 to 13 fathoms and some were found along the beach.

Subgenus *Limatula* Wood.

*Lima (Limatula) subauriculata* Montagu.

*Pecten subauriculata* Montagu, Suppl. to Test. Britannica [Vol. 3], 1808, p. 63, Tab. 29, fig. 2. On the coast of Devon, in deep water.

*Lima subauriculata* Montagu, Forbes & Hanley, Hist. Brit. Moll., Vol. 2, 1853, p. 263, pl. 53, figs. 4 and 5. Numerous localities cited in British Isles. Also said to range along all the coasts of Europe.

*Type Locality*: On the coast of Devon, England, in deep water.

*Range*: Izhut Bay, Afognak Island, Alaska, to Cape San Lucas, Lower California; northern Europe; North Atlantic; in West Atlantic south to Porto Rico; White Sea; circumboreal.

*Collecting Stations*: Mexico: east of Cedros Island (126-D-9,12), 45-56 fathoms, crushed shell, mud; Cape San Lucas.

*Description*: Shell ovate-oblong, pellucid, white, equilateral, equivalve, furnished with small, equal, angular projections, or subauricles, and wrought with numerous longitudinal striae that slightly crenulate the margin; along the middle are two striae that appear more conspicuous than the rest by being opaque and are equally evident on the inside; a character constant in several specimens examined. Length a quarter of an inch; breadth half its length (Montagu).

The two prominent riblets ornamenting the center of the valves of *Lima subauriculata* border a sulcus visible both exteriorly and interiorly. On the species described as *L. attenuata* by Dall, a sulcus is said to show only on the inside of the valves, while *L. similis* Dall is said to lack a sulcus.

*Distribution*: The distribution of *Lima subauriculata* is very wide. It is circumboreal and occurs in both the North Atlantic and Pacific waters. Woodring<sup>28</sup> has questioned the identity of the species cited under this name from western North America. Carpenter<sup>29</sup>, however, stated that a specimen from California "Exactly agrees with British specimens," and Dall and others have considered the west American shells to be identical with those from northern European waters. It has been recorded from various localities from later Tertiary to Recent.

<sup>28</sup> Woodring, W. P., U. S. Geol. Surv., Prof. Paper 190, 1938, pp. 49-50.

<sup>29</sup> Carpenter, P. P., Rept. Brit. Assoc. Adv. Sci. for 1863 (issued August, 1864), p. 612. Reprint in Smithsonian Miscell. Coll., No. 252, 1872, p. 98.

Superfamily Anomiacea.

FAMILY ANOMIIDAE.

Key to the genera of the Anomiidae.

- A. Hinge with cardinal crura *Placunanomia*  
 B. Hinge without cardinal crura  
   a. Imperforate valve with 1 large and two small muscle scars ..... *Anomia*  
   aa. Imperforate valve with 1 large and 1 small muscle scar ..... *Pododesmus*

Genus *Anomia* Linnaeus.

*Anomia peruviana* d'Orbigny.

*Anomia peruviana* d'Orbigny, Voy. Amér. Mérid., Vol. 5, 1846, p. 673. "environs de Payta (Pérou)," Recent.—Philippi, Abbild. u. Beschreib. Conchyl., Bd. 3, Heft 8, 1850, p. 131, *Anomia*, Tab. 1, figs. 2 and 3. Peru.—Grant and Gale, *Mem. San Diego Soc. Nat. Hist.*, Vol. 1, 1931, p. 240, pl. 12, figs. 2 and 5. Earlier records cited. Pliocene to Recent.

*Type Locality*: Paita, Peru.

*Range*: Monterey Bay, California, to Paita, Peru, and the Galápagos Islands.

*Collecting Stations*: Mexico: Santa Inez Bay (143-D-1, also beach; 144-D-2; 145-D-1, 3; 147-D-2), 2½-60 fathoms, mud, crushed shell, weed, sand, rocks; Cape San Lucas; Chamela Bay; Tenacatita Bay; Nicaragua: Monypenny Point, Gulf of Fonseca (199-D-1, 12, 22, also beach), 3-29 fathoms, sand, mud, crushed shell, mangrove leaves; Corinto (200-D-19) 12-13 fathoms, mangrove leaves; Panama: Gulf of Chiriqui (221-D-1-5), 35-40 fathoms, sandy mud.

*Description*: Shell variable in shape due to situs, generally fairly thin, partly translucent, smooth, radiately costate, or with irregular sculpture, often colored orange or yellowish-green, attached by a byssus which passes through a notch in the right valve; in the interior of the left valve there is a large scar below which there are two subequal scars, one just below the large upper scar, the other farther out and offset.

A number of species described by Gray, such as *Anomia alectus*, *A. fidenas*, *A. hamillus*, *A. lampe*, *A. larbas*, and *A. pacilus*, are now considered to be identical with *A. peruviana*. *Anomia simplex* Rochebrune is another synonym.

*Distribution*: This is a common species and ranges from Monterey Bay, California, to Paita, Peru. It occurs between tides or in shallow water attached to rocks or other objects. It is also known to occur from Pliocene to Recent in Southern California, Lower California, Panama, and in northern South America.

Genus *Pododesmus* Philippi.

*Pododesmus macrochisma* Deshayes.

*Anomia macrochisma* Deshayes, *Rev. Zool. Soc. Cuvierienne*, December, 1839, p. 359.



"Kamtschatka."—Deshayes, *Guerin's Mag. Zool.*, 1841, pl. 34.

*Placunanomia macrochisma* Deshayes, Reeve, *Conch. Icon.*, Vol. 11, *Placunanomia*, 1859, species 7, pl. 2, fig. 7. "Hab. Onalaska; Cuming. Kamtschatka; Deshayes."

*Pododesmus macrochismus* Deshayes, Grant and Gale, *Mem. San Diego Soc. Nat. Hist.*, Vol. 1, 1931, p. 241, pl. 12, figs. 3, 4a, 4b. Earlier records cited. Pliocene to Recent.

*Type Locality*: Kamchatka.

*Range*: Kamchatka to Cape San Lucas and Santa Inez Bay in the Gulf of California. Also to Japan.

*Collecting Stations*: Mexico: Arena Bank (136-D-4, 5, 6, 30), 33-55 fathoms, mud, sand, weed; Arena Point area; Santa Inez Bay (141-D-1-4) 7-20 fathoms, sand, sandy mud, crushed shell, weed, calcareous algae.

*Description*: Shell ovate, rather solid, somewhat pearly, ornamented by rude, irregular, radiating ribs; colored yellowish or greenish-white, inner surface green; upper valve with one large scar, sometimes striated, which is in contact with a smaller, lower, offset scar; lower valve with a large byssal orifice. Large specimens attain an altitude of about 100 mm.

*Pododesmus macrochismus* differs from the generally more southern *P. foliatus* Broderip<sup>30</sup>, in the coarser ribbing and in that the color of the interior is green rather than brown.

*Distribution*: This species occurs from Kamchatka to Santa Inez Bay in the Gulf of California and west to Japan. It occurs between tides or in shallow water attached to rocks or other objects. It is also known to occur from Pliocene to Recent in California.

Genus *Placunanomia* Broderip.

*Placunanomia cumingii* Broderip.

*Placunanomia cumingii* Broderip, *Proc. Zool. Soc. London*, April 21, 1832, p. 29. "Hab. ad oras Americae Centralis. (Gulf of Dulce, Province of Costa Rica)." "Dredged from a muddy bottom, at a depth of eleven fathoms, attached to dead bivalve shells and dead coral."—Reeve, *Conch. Icon.*, Vol. 11, *Placunanomia*, 1859, species 3, pl. 1, figs. 3a, 3b. original locality cited.

*Type Locality*: Gulf of Dulce, Costa Rica, in 11 fathoms, attached to shells and corals on a muddy bottom.

*Range*: Carmen Island, Gulf of California, to Ecuador.

*Collecting Stations*: Mexico: Arena Bank (136-D-5, 6, 30), 33-35 fathoms, sand, weed,

<sup>30</sup> *Placunanomia foliata* Broderip, *Proc. Zool. Soc. London*, May 14, 1834, p. 2. "Hab. in sinu Guayaquil Columbiae Occidentalis. (Isle of Muerte)." "Dredged up attached to a dead *Pinna* from a bottom of sandy mud, at the depth of eleven fathoms."—Reeve, *Conch. Icon.*, Vol. 11, *Placunanomia*, August, 1859, species 5, pl. 1, fig. 5. Original locality cited.

mud; Santa Inez Bay (141-D-1-4, also on shore), 7-20 fathoms, sand, sandy mud, crushed shell, weed, calcareous algae; Arena Point area; Costa Rica: Port Parker (203-D-3), 12 fathoms, shelly mud.

*Description*: Shell smooth, somewhat pearly, folded into three or four subangular plications which extend about two-thirds the distance to the beaks; color olive-white, especially interiorly; right valve with sub-central adductor scar and above this the closed (in adult) byssal scar; two prominent elevated ridges converge at the cardinal margin of the valve, these fit into a corresponding bipartite socket in the left valve; left valve with prominent byssal and adductor scars.

*Placunanomia plicata* Tuomey and Holmes described from the Miocene of South Carolina and *P. panamensis* Olsson<sup>31</sup> from the Pliocene of Panama are similar species.

*Distribution*: This species is found occasionally in comparatively shallow water from the Gulf of California to Ecuador, and it may occur as far south as Peru. It is also known to occur in the Pliocene and Pleistocene of the Tres Marias Islands, Mexico, and of Ecuador, and in the Pleistocene of Peru.

Superfamily Mytilacea.

FAMILY MYTILIDAE.

Key to the genera of the Mytilidae.

- A. Teeth on anterior part of hinge;  
beaks terminal or nearly so
- a. Shell with internal deck below  
beaks ..... *Septifer*
- aa. Shell without internal deck  
below beaks
- b. Shell not over 3 mm. from  
beak to base; oval, with fine  
divaricate sculpture ..... *Crenella*
- bb. Shell large, over 3 mm.  
from beak to base.
- c. Shell with crenellated margin  
posterior to the ligament;  
radial sculpture ..... *Brachidontes*
- cc. Shell without crenellated  
margin posterior to the  
ligament ..... *Mytilus*
- B. Without teeth on anterior part of hinge;  
beaks not terminal
- a. Shell subcylindrical or rhombic  
in cross-section
- b. Posterior end attenuated and  
wedge-shaped ..... *Lithophaga*
- bb. Posterior end not  
wedged-shaped ..... *Botula*

<sup>31</sup> *Placunanomia panamensis* Olsson, *Bull. Amer. Paleol.*, Vol. 27, No. 106, December 25, 1942, p. 183 (31), pl. 14 (1), figs. 1, 4, 5. "Quebrada Rabo de Puerco," Panama. Pliocene.

- aa. Shell obliquely oblong; strong umbonal inflation and often compressed dorsally ..... *Volsella*

Genus *Mytilus* Linnaeus.

Key to the subgenera of *Mytilus*.

- A. Anterior ventral margin strongly incurved forming a shelf in adult; no anterior adductor muscle scar ..... *Chloromya*
- B. Anterior ventral margin not incurved to form a shelf; anterior adductor scar present ..... *Mytilus* s. s.

Subgenus *Mytilus* s.s.

*Mytilus (Mytilus) californianus* Conrad.

*Mytilus californianus* Conrad, *Jour. Acad. Nat. Sci. Philadelphia*, Vol. 7, 1837, p. 242, pl. 18, fig. 15. "Inhabits on rocks, near Sta. Diego and Sta. Barbara, as well as at Monterrey," California.—I. S. Oldroyd, *Stanford Univ. Publ. Univ. Ser. Geol. Sci.*, Vol. 1, 1924, p. 66, pl. 27, fig. 2. Unalaska, Aleutian Islands, to Socorro Island, Mexico. Also Pliocene and Pleistocene of southern California.

*Type Locality*: San Diego, California. [Stated to be the type locality by I. S. Oldroyd, 1924, and accepted as such by the present writers.]

*Range*: Unalaska, Aleutian Islands, Alaska, to Socorro Island, Mexico.

*Collecting Station*: Mexico: Middle San Benito Island, Lower California.

*Description*: Shell large, thick ovately elongated, inflated; ventral margin nearly straight; ornamented by a few (sometimes a dozen) fairly broad, subdued radial ribs which occur on the median portion of the shell.

*Distribution*: This species occurs commonly from Alaska to Lower California, Mexico. It is found abundantly between tides attached to rocks or other objects. It is also known to occur in the Pliocene and Pleistocene of southern California.

Subgenus *Chloromya* Mörch.

*Mytilus (Chloromya) palliopunctatus* Dunker.

*Mytilus palliopunctatus* Dunker, in Carpenter, *Cat. Mazatlan Shells*, December, 1855, p. 118. "Mazatlan," Mexico.—Reeve, *Conch. Icon.*, Vol. 10, *Mytilus*, 1857, species 19, pl. 5, fig. 19. Mazatlan. [Not the record "California," but it does occur in Lower California.]

*Type Locality*: Mazatlan, Mexico.

*Range*: Magdalena Bay, Lower California, to Corinto, Nicaragua.

*Collecting Stations*: Mexico: Cape San Lucas, Lower California; Chamela Bay; Tenacatita Bay.

*Description*: Shell elongately ovate, pointed anteriorly and usually rubbed at various

angles; incurved along anterior ventral margin; periostracum dark, shell light purple in color, and with very fine radial striations; interior purple but white near the beak, and much of the surface finely punctate.

*Distribution*: This species is known to occur from Lower California to Nicaragua. It occurs between tides attached to rocks or other objects.

Genus *Brachidontes* Swainson.

Key to the subgenera of *Brachidontes*.

- A. Dorsal margin angulated ..... *Brachidontes* s.s.
- B. Dorsal margin rounded ..... *Hormomya*

Subgenus *Hormomya* Mörch.

*Brachidontes (Hormomya) adamsianus* Dunker.

*Mytilus adamsianus* Dunker, *Proc. Zool. Soc. London*, 1856 (issued May 8, 1857), p. 360. "Hab. ad Isthmum Panamense (Cuming)." —Reeve, *Conch. Icon.*, Vol. 10, *Mytilus*, January, 1858, species 55, pl. 11, fig. 55. Panama.

*Type Locality*: Isthmus of Panama.

*Range*: Santa Barbara, California, to Panama, and the Galápagos Islands.

*Collecting Station*: Costa Rica: Piedra Blanca, beach.

*Description*: Shell small for the genus, externally similar to *Septifer bifurcatus*; sloping steeply dorsally from the umbo; ornamented on the umbo by coarse radial bifurcating ribs and along the ventral margin by finer ribs. The shape and ribbing of this species is extremely variable. It may be narrow or wide and the ribbing may be coarse or fine and in some specimens coarse radial ornamentation changes abruptly to fine.

*Mytilus stearnsi* Pilsbry and Raymond<sup>32</sup> was described from San Diego, California. There do not appear to be any constant characters by which the form from southern California can be distinguished from the form described as *Mytilus adamsianus*.

There has been confusion regarding the identification of *Brachidontes adamsianus* and the species described as *Mytilus multiformis* Carpenter; in fact, Carpenter (1864) believed the two were identical. *Mytilus multiformis* Carpenter<sup>33</sup> was described from Mazatlan, Mexico, in 1855. A study of specimens from Mazatlan, as well as Carpenter's original description has led us to consider *Mytilus multiformis* to be a distinct species

<sup>32</sup> *Mytilus stearnsi* Pilsbry & Raymond, *Nautilus*, Vol. 12, No. 6, October, 1898, p. 70, pl. 4, figs. 1-3. Type from "San Diego," California.

<sup>33</sup> *Mytilus multiformis* Carpenter, *Cat. Mazatlan Shells*, December, 1855, p. 118. "Mazatlan; jun. abundant, rare adult, among sea weeds on Chamae, Spondylii, Ostreae, Patellae, etc., or in the cavities of dead Lithophagi or Balani."



characterized by its smaller size, *Volsella*-like shape, usually smooth umbos and with very fine ribbing. Furthermore it occurs in mats of moss on rocks while *adamsianus* usually occurs in crevices in rocks or on the under sides of rocks. Haas<sup>34</sup> and Chace<sup>35</sup> have recently discussed these two species.

*Distribution: Brachidontes (Hormomya) adamsianus* occurs from southern California to Panama and the Galápagos Islands. It is often found between tides occurring in crevices or attached to the under sides of rocks, where only the end of the shell is exposed to the waves.

#### Genus *Septifer* Recluz.

*Septifer* Recluz, *Rev. Zool. Soc. Cuvierienne*, 1848, Vol. 11, p. 277.—Stoliczka, *Mem. Geol. Surv. India. Palaeont. Indica*. Ser. 6, Cret. Fauna South. India, Vol. 3, 1871, pp. XXI, 366. "Type, *S. bilocularis*, Linn."—Grant and Gale, *Mem. San Diego Soc. Nat. Hist.*, Vol. 1, 1931, p. 247. Type: *Mytilus bilocularis* Linnaeus.—Lamy, *Journ. de Conchyl.*, Vol. 80, No. 3, September 1, 1936, p. 239.

Type (designated by Stoliczka): *Septifer bilocularis* Linnaeus [Syst. Nat., ed. 10, Vol. 1, 1758, p. 705. "Habitat in O. Indico." Illustrated by Chemnitz, *Conchyl.-Cab.*, Bd. 8, 1785, p. 155, pl. 82, figs. 736a, 736b (as *Mytilus nicobaricus*) and p. 157, pl. 82, fig. 737 (Nos. 1, 2, 3) (as "Varietas mytili Nicobarici viridescens"). Nicobar Islands.—Prashad, Siboga Exped., Monogr. 53c, Lamell., 1932, p. 69, pl. 2, figs. 21-24. East Indies.]

The shell of *Septifer* may be separated from those of *Mytilus* or of *Brachidontes* by the presence of a small deck in the anterior end of the shell just below the hinge. The genus *Septifer* has been recorded from upper Cretaceous to Recent. Lamy<sup>36</sup> has given a discussion of a number of Recent species of *Septifer*.

#### *Septifer zeteki* Hertlein and Strong, sp. nov.

Plate I, Figures 1 and 2.

*Septifer cumingii* Recluz, cited from west American localities. Not *Septifer cumingii* Recluz from the island of Annaa.

*Mytilus cumingianus* cited from west American localities. Not *Mytilus cumingianus* Reeve.

*Description:* Shell small, subtriangular in outline, inflated, expanded posteriorly, colored green; umbos small, anterior dorsal margin nearly straight, posterior margin rounded, the upper part broadly, the ventral part less so, ventral margin slightly im-

pressed and gaping toward the anterior end, a light brown colored byssus projects through the opening; the ventral part of the valve slopes steeply from the umbonal ridge but the dorsal part slopes more gently; surface of shell ornamented by fine radial ribs which in many cases become divaricate toward the posterior, the ribs are finely decussated by impressed concentric lines of growth; a septum is present interiorly just below the beaks, and is nearly straight across at the free end; the margin of the shell is crenulated; the interior of the shell is bluish colored or tinged with green. Length 6.8 mm., greatest height 4.1 mm., convexity (both valves) 3.5 mm.

Holotype and two paratypes (Calif. Acad. Sci. Paleo. Type Coll.) from off Taboga Island, Panama, in 25 fathoms, dredged by James Zetek. Paratype from Station 195-D-9, Port Guatulco, Mexico, dredged in 7 fathoms.

*Range:* Gulf of California to Panama and the Galápagos Islands.

*Collecting Station:* Mexico: Port Guatulco (195-D-9), in 7 fathoms, green sand and crushed shell.

This species has been cited from west American localities under the name of *Septifer cumingii* Recluz,<sup>37</sup> a species originally described from "les côtes de l'île Annaa (près le détroit de Panama), dans l'océan Pacifique." Reeve later described and illustrated a species under the name of *Mytilus cumingianus*<sup>38</sup> and cited the locality as Panama, and indicated that the specimen was collected by Cuming. The citation of this locality by Reeve probably influenced authors in accepting the name *Septifer cumingii* for a west American species.

E. A. Smith<sup>39</sup> later considered the problem of the identification of *Septifer cumingii* and stated that there was no reason to doubt the original locality of Recluz cited as the Island of Annaa, in Polynesia, and pointed out that Cuming collected at that island.

He also pointed out that Reeve was mistaken in his reference, orthography of the specific name, and the locality. After a comparison of the type of *Septifer cumingii* with specimens of *S. bilocularis* Linnaeus, the type of the genus, he concluded that there were no grounds for separating them.

After a consideration of the facts we have concluded that it is necessary to assign a new name to the west American form. The species is named in honor of Dr. James Zetek, Balboa, Canal Zone, Panama.

<sup>34</sup> Haas, F., *Nautilus*, Vol. 56, No. 1, July, 1942, pp. 31-32.—Haas, *Field Mus. Nat. Hist.*, Zool. Ser., Vol. 29, No. 1, 1943, pp. 16-17.

<sup>35</sup> Chace, E. P., *Nautilus*, Vol. 56, No. 2, October, 1942, p. 43.

<sup>36</sup> Lamy, E., *Journ. de Conchyl.*, Vol. 80, No. 3, 1936, pp. 239-252.

<sup>37</sup> *Septifer cumingii* Recluz, *Rec. Zool. Mag. Guérin*, Ser. 2, Vol. 1, 1849, p. 132.

<sup>38</sup> *Mytilus cumingianus* Recluz, MS., Reeve, *Conch. Icon.*, Vol. 10, *Mytilus*, January, 1858, species 52, pl. 11, fig. 52. "Hab. Panama."

<sup>39</sup> Smith, E. A., *Rept. Sci. Res. Voy. Challenger*, Zool., Vol. 13, 1885, p. 271.

*Septifer zeteki* resembles *S. bilocularis*, the type of the genus, but never attains the size of that species. It also somewhat resembles *Septifer bryani* Pilsbry,<sup>40</sup> originally described from the Hawaiian Islands, but the ribs appear to be coarser and less numerous than those of the Hawaiian species.

Genus *Volsella* Scopoli [= *Modiolus* Lamarck].

Key to the subgenera of *Volsella*.

- A. Shell inflated, posterior dorsal area without zigzag markings.....*Volsella* s.s.  
 B. Shell weakly inflated, narrow, posterior area with zigzag markings .....*Amygdalum*

Subgenus *Volsella* s.s.

Key to the species of *Volsella* s.s.

- A. Shell arcuate, narrow..... *arciformis*  
 B. Shell not arcuate, broad  
 a. Shell with raised concentric sculpture especially posteriorly .....*guyanensis*  
 aa. Shell with fine equal concentric lines of growth  
 b. Posterior end subquadrate .....*salvadorica*  
 bb. Posterior end gently truncated and roundly attenuated.....*capax*

*Volsella (Volsella) arciformis* Dall.

Plate I, Figure 5.

*Modiolus arciformis* Dall, *Proc. U. S. Nat. Mus.*, Vol. 37, 1909, pp. 152, 258, pl. 28, fig. 2. "Huaquilla on the Ecuador border; apparently from a shellheap."

*Type Locality*: Huaquilla, Ecuador, apparently from a shellheap.

*Range*: La Union, El Salvador, to Huaquilla, Ecuador.

*Collecting Stations*: El Salvador: La Union, Gulf of Fonseca (199-D-16), 6 fathoms, mud; Nicaragua: Monypenny Point, Gulf of Fonseca.

*Description*: Shell rather narrow and decidedly arcuate in outline after attaining a length of 40 mm. This feature is not pronounced in young specimens. A decided umbonal ridge is present, due to the compressed character of the ventral part of the shell. The interior of the shell is pearly and of a purplish color.

*Distribution*: The discovery of the occurrence of this species in the Gulf of Fonseca, extends the known range north to El Salvador.

*Volsella (Volsella) capax* Conrad.

*Modiola capax* Conrad, *Journ. Acad. Nat. Sci. Philadelphia*, Vol. 7, 1837, p. 242. "In-

habits marshes and muddy shores about Sta. Diego." [California].—Reeve, *Conch. Icon.*, Vol. 10, *Modiola*, 1857, species 11, pl. 3, fig. 11. "Hab. Galapagos Islands; Cuming. California; Nuttall. Mazatlan; Carpenter."

*Type Locality*: San Diego, California, in marshes and on muddy shores.

*Range*: Santa Cruz, California, to Paita, Peru.

*Collecting Stations*: Mexico: Santa Inez Bay, east coast of Lower California, beach; Cape San Lucas, beach; Chamela Bay, beach; Costa Rica: Port Parker, beach; Cedro Island, Gulf of Nicoya, beach.

*Description*: This species is easily recognized in the southern fauna by the large, thick shell and by the brick red color which is often present on worn surfaces.

*Volsella capax* differs from the generally more northern *V. modiolus* in possessing a heavier, more inflated shell which has a more depressed area between the umbos.

*Distribution*: This species occurs quite commonly from southern California to Peru.

*Volsella (Volsella) guyanensis* Lamarck.

*Modiola guyanensis* Lamarck, *Anim. s. Vert.*, Vol. 6, February-June, 1819, p. 112. "Habite les mers de la Guyane."—Delessert, *Rec. Coq. décrites par Lamarck et non encore figurées*, 1841, pl. 13, fig. 9. Original locality cited.

*Modiola brasiliensis* Chemnitz, Reeve, *Conch. Icon.*, Vol. 10, *Modiola*, August, 1857, species 17, pl. 4, fig. 17, Guayaquil; pl. 6, fig. 31. Brazil.

*Type Locality*: Guiana.

*Range*: San Ignacio Lagoon, Lower California, and the Gulf of California, to Paita, Peru. Also from Trinidad to Brazil on the Atlantic coast.

*Collecting Stations*: Nicaragua: Potosi and Monypenny Point; Isla Encantada, Corinto; Costa Rica: Ballenas Bay.

*Description*: This handsome shell is ornamented by well developed raised concentric growth lines which are especially pronounced posteriorly. The anterior part of the shell is usually colored some shade of brown while the posterior part is green, blackish-green, or in some cases the entire shell may be colored brownish-black.

Carpenter described "*Modiola ?Brasiliensis*, var. *mutabilis*"<sup>41</sup> from Mazatlan, Mexico. He considered it as possibly representing a rough water form of *brasiliensis*. The margins of this form were described as less straight and angular and the diagonal keel less impressed than that of the typical species. This subspecies is of doubtful value.

<sup>40</sup> See Dall, W. H., Bartsch, P., and Rehder, H. A., *Bernice P. Bishop Mus.*, *Bull.* 153, July 25, 1938, p. 51, pl. 9, figs. 1-4. Cited from various localities in the Hawaiian Islands.

<sup>41</sup> *Modiola ?Brasiliensis*, var. *mutabilis* Carpenter, *Cat. Mazatlan Shells*, January, 1856, p. 122. "Mazatlan," Mexico.



*Volsella guyanensis* (= *Volsella brasiliensis* Chemnitz) is one of the species which occurs in both east and west American waters and there seems to be no positive method by which specimens from the two regions can be separated. A certain amount of variation might be expected in a species occurring over such a wide range.

**Distribution:** This species has a wide distribution. It occurs in shallow water from the Gulf of California to Peru and on the Atlantic coast from Trinidad to Brazil.

***Volsella (Volsella) salvadorica***

Hertlein and Strong, sp. nov.

Plate I, Figures 7 and 11.

Shell thin, subquadrate, moderately inflated, smooth; hinge line almost straight, with the beaks at about one-fourth the distance from the anterior end; beaks pointing forward and almost resting on the hinge; dorsal margin nearly straight; ventral margin with a slight concavity in the middle; anterior end rounded; posterior end sloping obliquely from the dorsal margin and rounded at the dorsal and ventral margins; umbonal ridge well developed; a slight convexity anterior to the ridge begins on the beaks and continues to the ventral margin; the dorsal posterior part of the valve is subalate; color of exterior of shell grading from light to chocolate brown, interior light purple and somewhat iridescent. Length 23.6 mm., height 13.9 mm., diameter (one valve) 5.8 mm.

Holotype, left valve (Calif. Acad. Sci. Paleo. Type Coll.), from Station 198-D-2, Lat. 13°27'20"N., Long. 89°19'20"W., dredged in 14 fathoms (25 meters) off La Libertad, El Salvador. Paratype, right valve, from Station 199-D-6, Lat. 13°02'30"N., Long. 87°29'30"W., dredged in 4 fathoms (7.2 meters) off Monypenny Point, Gulf of Fonseca, Nicaragua. One small specimen from Station 199-D-1, Lat. 13°08'N., Long. 87°43'W., dredged in 16 fathoms (29 meters), off Meanguera Island, Gulf of Fonseca, El Salvador.

*Volsella salvadorica* sp. nov. differs from *V. capax* in the straighter, longer hinge line, and much more quadrate shape.

Subgenus ***Amygdalum*** Megerle von Mühlfeld.

Key to the species of *Amygdalum*.

- A. Posterior end of shell evenly rounded, colored yellowish-white ..... *pallidula*  
 B. Posterior end of shell obliquely truncated, colored yellowish-green ..... *speciosa*

***Volsella (Amygdalum) pallidula* Dall.**

*Modiolus* (? *politus* Verrill var.) *pallidulus* Dall, *Proc. U. S. Nat. Mus.*, Vol. 52, De-

ember 27, 1916, p. 404. "Off San Luis Obispo Bay, in 77 fathoms."

**Type Locality:** Off San Luis Obispo Bay, California, in 77 fathoms.

**Range:** Bodega Head, California, to Acapulco, Mexico.

**Collecting Station:** Mexico: East of Cedros Island (126-D-10, 12), 45-60 fathoms, crushed shell, eel grass, mud.

**Description:** Shell small, thin, brilliantly polished, a large translucent dorsal area with whitish colored zigzag reticulations, and a smaller, opaque, white ventral area.

*Volsella polita* Verrill and Smith,<sup>42</sup> from the Atlantic and *V. sagittata* Rehder<sup>43</sup> from the Gulf of Mexico are similar species, as is *V. peasei* Newcomb<sup>44</sup> from the Hawaiian Islands.

**Distribution:** This species is known to occur from Bodega Head, California, to Acapulco, Mexico. It has been dredged usually in depths of 45 to 75 fathoms, or even in deeper water.

***Volsella (Amygdalum) speciosa* Dunker.**

*Modiola speciosa* Dunker in Reeve, *Conch. Icon.*, Vol. 10, *Modiola*, October, 1857, species 35, pl. 7, fig. 35. "Hab. Tumbez, Peru; Cuming."

**Type Locality:** Tumbez, Peru.

**Range:** Magdalena Bay, Lower California, to Paita, Peru.

**Collecting Station:** Nicaragua: Monypenny Point, Gulf of Fonseca (199-D-3, 4, 5), 6-7 fathoms, mud.

**Description:** Shell elongate, slender, smooth; the periostracum of the anterior ventral region is light brown in color and the dorsal posterior portion is ornamented with fine dashes and zigzag brown lines which are separated upon a bright green ground color. The largest specimen in the present collection measures approximately 56.9 mm. in length.

Compared to *Volsella speciosa*, *V. tumbezensis* Pilsbry and Olsson,<sup>45</sup> also described from Peru, is said to possess a smaller shell which is wider posteriorly.

**Distribution:** *Volsella speciosa* is not a common species but is found occasionally from Magdalena Bay, Lower California, to Paita, Peru.

<sup>42</sup> *Modiola polita* Verrill and Smith, *Amer. Jour. Sci.*, Ser. 3, Vol. 20, November, 1880, p. 400. From Lat. 39°56'30"N., Long. 70°59'45"W., in 238 fathoms.—Verrill, *Trans. Connecticut Acad. Sci.*, Vol. 6, 1884, p. 281, pl. 30, fig. 12 (as *Modiolaria polita*).

<sup>43</sup> *Modiolus (Amygdalum) sagittatus* Rehder, *Nautilus*, Vol. 48, No. 4, April, 1935, p. 127, pl. 7, figs. 11, 12. Type "from the Gulf of Mexico, off Cape San Blas, Florida." Also from off Cape Florida.

<sup>44</sup> *Volsella (Amygdalum) peasei* Newcomb, Dall, Bartsch and Rehder, *Bernice P. Bishop Mus.*, Bull. 153, 1938, p. 45, pl. 8, figs. 11-14. Cited from various localities off the Hawaiian Islands, in 4 to 50 fathoms.

<sup>45</sup> *Modiolus (Modiolus) tumbezensis* Pilsbry and Olsson, *Nautilus*, Vol. 49, No. 1, July, 1935, p. 16, pl. 1, fig. 5. "Beach at Puerto Pizarro, northern Peru."

Genus *Botula* Mörch.Key to the subgenera of *Botula*.

- A. Beaks subterminal; posterior umbonal area rounded.....*Botula* s.s.  
 B. Beaks between center and anterior end; posterior umbonal area angulated .....*Adula*

Subgenus *Adula* H. & A. Adams.*Botula (Adula) falcata* Gould.

*Lithodomus falcatus* Gould, *Proc. Boston Soc. Nat. Hist.*, Vol. 4, November, 1851, p. 92. "Monterey, in indurated marly clay."—Gould, *Boston Journ. Nat. Hist.*, Vol. 6, October, 1853, p. 403, pl. 16, fig. 9. Original locality record cited.

*Botula falcata* Gould, I. S. Oldroyd, *Stanford Univ. Publ. Univ. Ser. Geol. Sci.*, Vol. 1, 1924, p. 71, pl. 21, figs. 8, 9. Coos Bay, Oregon, to San Diego, California.

*Type Locality*: Monterey Bay, California, in indurated marly clay.

*Range*: Coos Bay, Oregon, to Cape San Lucas, Lower California.

*Collecting Station*: Mexico: Cape San Lucas, Lower California.

*Description*: Shell subcylindrical, falcate, fragile, beaks about one eighth the length from the anterior end; a strongly marked angle occurs from the beaks to the base of the posterior extremity; ornamented by vertical wrinkles posteriorly, and these are somewhat divaricate anteriorly; periostracum thick, chestnut colored.

The vertical sculpture, larger and more elongate valves, are characters which serve to separate *Botula falcata* from *B. californiensis* Philippi.

*Distribution*: The discovery of the occurrence of *Botula falcata* at Cape San Lucas, Lower California, is an extension southward in the known range. It bores into rocks and attaches itself by a byssus to the sides of the burrow.

Genus *Lithophaga* Bolten.Key to the subgenera of *Lithophaga*.

- A. Calcareous prolongations of shell crossed at posterior end.....*Myoforceps*  
 B. Calcareous prolongations of shell not crossed at posterior end  
 a. Calcareous incrustation of shell smooth .....*Labis*  
 aa. Calcareous incrustation with divaricate plumose pattern posteriorly .....*Diberus*

Subgenus *Myoforceps* Fischer.*Lithophaga (Myoforceps) aristata* Dillwyn.

*Mytilus aristatus* Dillwyn, *Descript. Cat. Rec. Shells*, Vol. 1, 1817, p. 303. "Inhabits the coasts of Senegal burrowed in the shells of Balani. Adanson. In calcareous rocks. Sowerby." Reference to Adanson, *Hist.*

*Nat. Senegal*, 1757, p. 267, pl. 19, fig. 2; *Encycl. Meth.*, pl. 221, fig. 8; *Linn. Trans.*, Vol. 8, pl. 6, fig. 2.

*Lithophaga aristata* Dillwyn, I. S. Oldroyd, *Stanford Univ. Publ. Univ. Ser. Geol. Sci.*, Vol. 1, 1924, p. 73, pl. 39, fig. 2. La Jolla, California, to Peru. Also Atlantic.

*Type Locality*: Coast of Senegal, Africa, in shells of Balani, also in calcareous rocks.

*Range*: La Jolla, California, to Peru. Also in the Atlantic; world wide.

*Collecting Stations*: Mexico: Punta Arena area; Pulmo Reef; Port Guatulco (195-D-15), 1.5 fathoms, coral; Acapulco; Tangola-Tangola Bay, on beach; Costa Rica: Port Parker, on beach; Cedro Island, Gulf of Nicoya (213-D-4-15), 5-40 fathoms, mud; Colombia: Gorgona Island.

*Description*: Shell subcylindrical, fairly straight, smooth, thin; a whitish calcareous coating usually covers the yellowish periostracum at the posterior end and extends beyond the shell in two narrow beak-like prolongations which cross as in the blades of a pair of scissors. Lamy has discussed this species and its synonymy (*Journ. de Conchyl.*, Vol. 81, 1937, pp. 169-174).

*Distribution*: This species is found from southern California to Peru, in holes which it has bored into rocks. It also occurs in the Atlantic and world wide in tropical seas. Dall recorded the species from the lower Miocene of Ballast Point, Tampa Bay, Florida, and the present authors recorded its occurrence in the Pleistocene of the Galápagos Islands.

Subgenus *Labis* Dall.*Lithophaga (Labis) attenuata* Deshayes.

*Modiola attenuata* Deshayes, *Lamarek's Anim. s. Vert.*, Vol. 7, 1836, p. 28. "Habite au Pérou, au Chile, dans les pierres." Ref. to "*Lithodomus caudigerus* var.," Sowerby, *Gen. Shells*, [Vol. 2, pl. 135] fig. 3.—Philippi, *Abbild. u. Beschreib. Conchyl.*, Bd. 2, Heft 5, *Modiola*, October, 1846, p. 148 (2), tab. 1, fig. 6. "Patria: Litus Peruviae et Chili."

*Lithophaga attenuata* Deshayes, I. S. Oldroyd, *Stanford Univ. Publ. Univ. Ser. Geol. Sci.*, Vol. 1, 1924, p. 73, pl. 39, fig. 10. Lower California.

*Type Locality*: Peru and Chile.

*Range*: San Ignacio Lagoon, Lower California, to Chile.

*Collecting Station*: Costa Rica: Port Parker.

*Description*: Shell characterized by its slender produced form. The beaks are appressed, smooth, and the entire inner surface is hollow. This species is the type of the subgenus *Labis* Dall, which "has on each valve a semicylindrical smooth appendage of which the distal end is internally flattened and somewhat separated from the



appendage of the opposite valve, the ends being rounded."

*Distribution:* This species has been cited as occurring as far south as southern Chile. We have not seen specimens from north of San Ignacio Lagoon, Lower California. Like others of the genus it bores into rocks.

Subgenus *Diberus* Dall.

*Lithophaga (Diberus) plumula* Hanley.

Plate I, Figure 10.

*Lithodomus plumula* Hanley, *Proc. Zool. Soc. London*, July, 1844, p. 17. "Hab. Panama, in *Spondyli*."—Reeve, *Conch. Icon.*, Vol. 10, *Lithodomus*, 1857, species 23, pl. 4, fig. 23. Original locality cited.

*Modiola (Lithodomus) plumula* Hanley, *Hanley, Cat. Rec. Bivalve shells*, pl. 24, fig. 23, 1856. [Not the record p. 240, "Philippines"].

*Lithophagus calyculatus* Carpenter, *Cat. Mazatlan Shells*, January, 1856, p. 124. "Hab.—Mazatlan; 1 sp. in *Spondylus calceifer*."

*Type Locality:* Panama, in *Spondyli*.

*Range:* San Ignacio Lagoon, Lower California, to Peru.

*Collecting Stations:* Mexico: Pulmo Reef, Arena Point, Lower California; Costa Rica: Port Parker; Colombia: Gorgona Island.

*Description:* The characteristic features of this species were mentioned by Hanley as follows: "The calcareous cellular coating of the umbonal ridge, resembling a ruffled feather in its arrangement, being composed of elevated thin ridges which slope anteriorly and diverge from their point of junction, one half to the anterior dorsal, the other to the ventral margin."

Carpenter's description of *Lithophaga calyculata* agrees exactly with that of Hanley for *L. plumula* and is therefore placed in the synonymy of Hanley's species in the present paper.

Specimens from San Diego and north to Duxbury Reef, Mendocino county, California, which have been referred to *Lithophaga plumula*, usually differ from typical forms of that species in that the calcareous incrustation usually lacks the definite arrow-head pattern of a central ridge from which lines point toward the vertex of the triangle of incrustation (see Plate I, Figures 8 and 9). For the California form we propose the subspecific name *Lithophaga plumula kelseyi*. (Calif. Acad. Sci. Paleo. Type Coll.) from Loc. 5865 (C. A. S. Coll. H. Hemphill collector), San Diego, California.

*Distribution:* *Lithophaga plumula* occurs fairly commonly at certain localities along the west coast from Mexico to Peru where

it is found between tides in rocks into which it has bored.

Genus *Crenella* Brown.

*Crenella divaricata* d'Orbigny.

Plate I, Figures 12 and 13.

*Nuculocardia divaricata* d'Orbigny, in Sagra, *Hist. Cuba*, *Moll.*, Vol. 2, 1845, p. 311, atlas, pl. 27, figs. 56, 57, 58, 59. "Se trouve dans presque toutes les Antilles; au moins l'avons-nous de la Martinique, de la Guadeloupe, de la Jamaïque et de Cuba."—Chenu, *Man. de Conchyl.*, Vol. 2, 1862, p. 154, fig. 754.

*Crenella divaricata* d'Orbigny, *Maury, Bull. Amer. Paleo.*, Vol. 10, *Bull.* 42, 1925, p. 247 (95), pl. 29 (18), fig. 13. Springvale, Trinidad. Miocene.

*Type Locality:* Cuba (here designated). Martinique, Guadeloupe, Jamaica and Antilles also cited originally.

*Range:* Guadalupe Island, off Lower California, Mexico, and the Gulf of California, to Ecuador. Also Atlantic, from North Carolina to Venezuela.

*Collecting Stations:* Mexico: Santa Inez Bay (145-D-1, 3), 4-13 fathoms, sand; Manzanillo (184-D-2), 30 fathoms, gravelly sand; Port Guatulco (195-D-9), 7 fathoms, green sand, crushed shell; Costa Rica: Port Parker (203-D-1, 3), 12-15 fathoms, sandy mud, crushed shell, shelly mud.

*Description:* Shell small, elongately oval in shape, colored yellowish-white, ornamented by fine radial divaricate striations which are decussated by concentric sculpture; margins crenellated; a single strong crenellated denticle is present on the hinge.

A study of the literature and of the museum material available has led us to accept the conclusion of Dall that these tropical west American specimens can be referred to d'Orbigny's species *Crenella divaricata* which was originally described from the Caribbean region. The species has been cited from various geologic formations back to the Miocene.

*Crenella ecuadoriana* Pilsbry and Olsson,<sup>46</sup> described from the Pliocene of Ecuador, appears to be identical except for the slightly larger size of the fossil form.

Another name for the recent species is *Crenella inflata* Carpenter,<sup>47</sup> originally described from Cape San Lucas, Lower California.

We have not noticed any occurrence of *Crenella divaricata* north of Mexico. Specimens which we have studied from southern California are referable to *Crenella decussata* Montagu and appear to be identical with specimens from England and from the

<sup>46</sup> *Crenella ecuadoriana* Pilsbry and Olsson, *Proc. Acad. Nat. Sci. Philadelphia*, Vol. 93, September 9, 1941, p. 55, pl. 18, figs. 2 and 3. "Canoa formation, Punta Blanca," Ecuador, Pliocene.

<sup>47</sup> *Crenella inflata* Carpenter, *Ann and Mag. Nat. Hist.*, Ser. 3, Vol. 13, April, 1864, p. 313. "Cape St. Lucas,"

Lower California. Reprint in *Smithson. Miscell. Coll.*, No. 252, 1872, p. 211.

Not *Crenella inflata* Müller, *Holzappel, Palaeontographica*, Bd. 35 (Moll. Aachner Kreide. Abt. 2), 1889, p. 220, pl. 25, figs. 17, 18. Cretaceous of Germany. [Originally described as *Mytilus inflatus*].

Atlantic coast of the United States. The shells of *Crenella divaricata* are more inflated, more elongately oval in outline, and the hinge is more strongly developed in comparison with that of *C. decussata*.

*Crenella megas* Dall<sup>48</sup> described from Panama possesses a larger, thinner, delicately ornamented shell which is more pointed posteriorly in comparison with that of *C. divaricata*.

*Distribution*: *Crenella divaricata* occurs fairly commonly in west American waters at depths of 5 to 50 fathoms from Guadalupe Island, Mexico, to Ecuador, and along the Atlantic coast from North Carolina to the West Indies. It has been recorded from Miocene to Recent in the Caribbean region and is at present known from Pliocene to Recent on the Pacific coast.

## EXPLANATION OF THE PLATE.

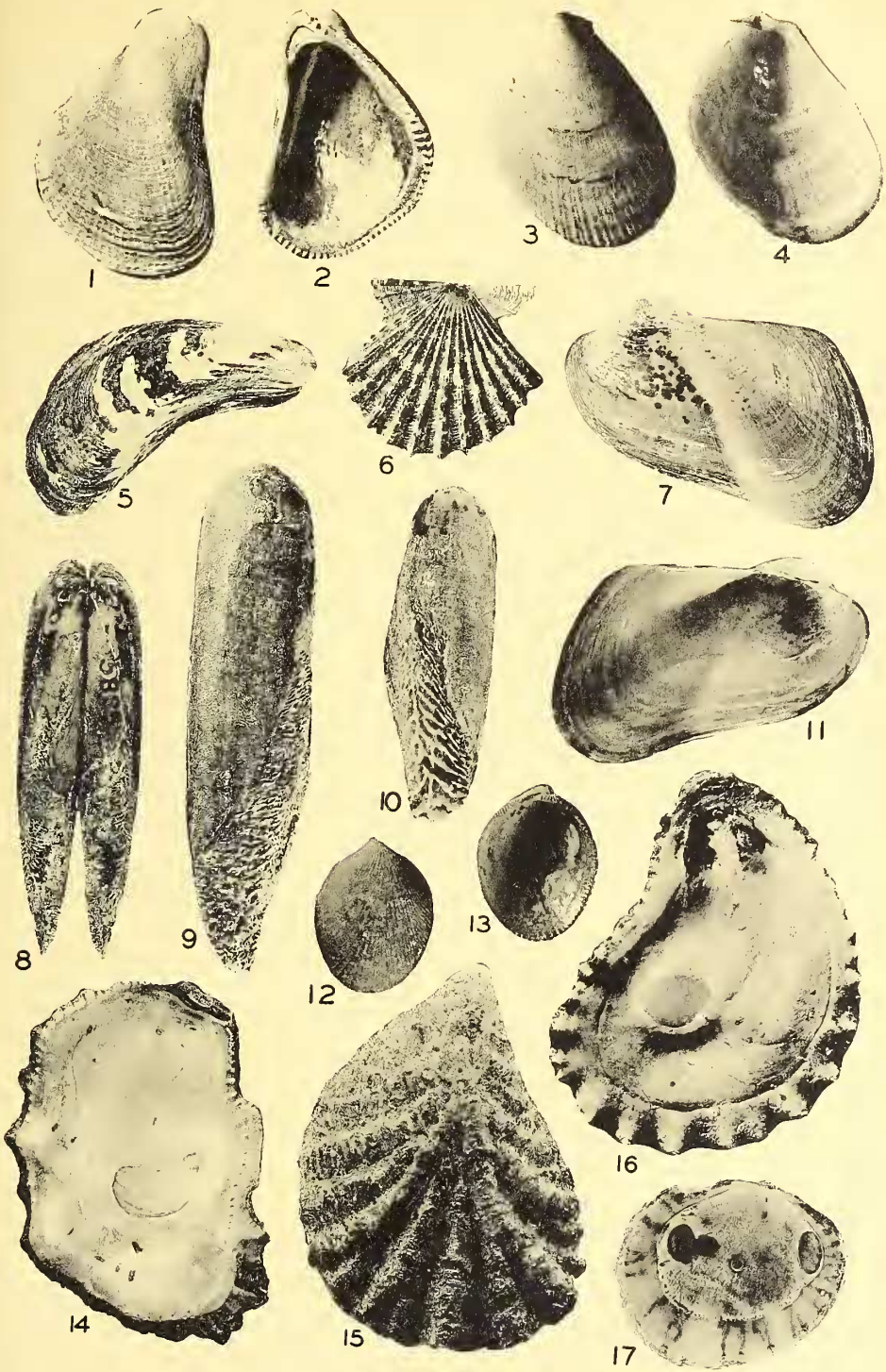
### PLATE I.

- Fig. 1. *Septifer zeteki* Hertlein & Strong, sp. nov. Paratype, right valve, from Station 195-D-9, dredged in Lat. 15°44'28"N., Long. 96°07'51"W., off Port Guatulco, Mexico, in 7 fathoms (12.6 meters). Length (beak to base) 6 mm. P. 71.
- Fig. 2. *Septifer zeteki* Hertlein & Strong, sp. nov. View of the interior of the specimen shown in Figure 1.
- Fig. 3. *Lima hemphilli* Hertlein & Strong, sp. nov. Holotype, left valve, from Loc. 5955 (Calif. Acad. Sci.), San Diego, California, Henry Hemphill collector. Altitude 23 mm., length 16.4 mm. P. 66.
- Fig. 4. *Lima hemphilli* Hertlein & Strong, sp. nov. Holotype, right valve. View of interior of right valve of specimen shown in Figure 3.
- Fig. 5. *Volsella (Volsella) arciformis* Dall. Hypotype, right valve, from Monypenny Point, Nicaragua. Length 41 mm., greatest width approximately 16.5 mm. P. 72.
- Fig. 6. *Pecten (Leptopecten) velero biolleyi* Hertlein & Strong, subsp. nov. Holotype, right valve, from Station 203-D-3, dredged in Lat. 10°55'45"N., Long. 85°49'05"W., near Port Parker, Costa Rica, in 12 fathoms (22 meters). Length 6.9 mm., altitude 6.6 mm. P. 60.
- Fig. 7. *Volsella (Volsella) salvadorica* Hertlein & Strong, sp. nov. Holotype, left valve, from Station 198-D-2, dredged in Lat. 13°27'20"N., Long. 89°19'20"W., off La Libertad, El Salvador, in 14 fathoms (25 meters). Length 23.6 mm., height 13.9 mm. P. 73.
- Fig. 8. *Lithophaga plumula kelseyi* Hertlein & Strong, subsp. nov. Holotype, from Loc. 5865 (Calif. Acad. Sci.), San Diego, California, Henry Hemphill collector. Length 57.2 mm., greatest height approximately 14 mm. P. 75.
- Fig. 9. *Lithophaga plumula kelseyi* Hertlein & Strong, subsp. nov. Side view of left valve of specimen shown in Figure 8.
- Fig. 10. *Lithophaga (Diberus) plumula* Hanley. Hypotype, right valve, from Port Parker, Costa Rica. Length 48.2 mm., height 14 mm., convexity (both valves) 14.3 mm. View of exterior of right valve. P. 75.
- Fig. 11. *Volsella (Volsella) salvadorica* Hertlein & Strong, sp. nov. View of interior of specimen shown in Figure 7.
- Fig. 12. *Crenella divaricata* d'Orbigny. Hypotype, left valve, from Station 145-D-1, dredged in Lat. 26°52'N., Long. 111°53'W., Santa Inez Bay, east coast of Lower California, in 13 fathoms (24 meters). Height (beak to base) approximately 3 mm., length approximately 2 mm. P. 75.
- Fig. 13. *Crenella divaricata* d'Orbigny. View of the interior of the specimen shown in Figure 12.
- Fig. 14. *Ostrea palmula* Carpenter. View of interior of upper valve of holotype from Mazatlan, Mexico. Original measurements given as "Long. 2.3, lat. 1.6, alt. .54" poll. Carpenter at the time of descriptions of species in 1865 (*Journ. de Conchyl.*, Vol. 12 (Ser. 3, Vol. 5), April, 1865, p. 133 (footnote). Reprint in *Smithson. Miscell. Coll.*, No. 252, 1872, p. 301) stated that the unit "poll." used in the descriptions was 2.53 cm. in length. Dr. Teng-Chien Yen who, while at the British Museum of Natural History, investigated this unit of measurement, stated that the length of a pollex is approximately 2 cm.
- This photograph was obtained from authorities of the British Museum of Natural History by Dr. U. S. Grant, IV, who kindly permitted us to use it to illustrate the species. P. 55.
- Fig. 15. *Plicatula spondylopsis* Rochebrune. Hypotype, left valve, from the Gulf of California, without exact locality but probably from Arena Bank. Height (beak to base) approximately 52.6 mm., length approximately 38 mm., convexity (both valves) approximately 25 mm. P. 63.
- Fig. 16. *Plicatula spondylopsis* Rochebrune. Hypotype, left valve, from station 136-D-26, dredged in Lat. 23°27'N., Long. 103°24'W., Gorda Bank, Gulf of California, in 45 fathoms (82 meters). Height (beak to base) 53.6 mm., length 40.5 mm. P. 63.
- Fig. 17. *Dimya californiana* Berry. Hypotype, left valve, from Station 137-D-2, dredged in Lat. 24°11'N., Long. 109°59'W., Ceralbo Channel, Gulf of California, in 46 fathoms (84 meters). Length 10.8 mm., height (beak to base) 8.7 mm., convexity (one valve) approximately 1.8 mm. P. 65.

<sup>48</sup> *Crenella megas* Dall, *Proc. U. S. Nat. Mus.*, Vol. 24, March 31, 1902, p. 559. "Dredged at station 2795, in Panama Bay, at a depth of 33 fathoms, sand, bottom temperature 64 F."—Dall, *Proc. U. S. Nat. Mus.*, Vol. 26, 1903, p. 950, pl. 62, fig. 4.

All the specimens illustrated on this Plate are in the type collection of the Department of Paleontology of the California Academy of Sciences.





MOLLUSKS FROM THE WEST COAST OF MEXICO AND CENTRAL AMERICA.